THE

ELECTRICAL REVIEW.

VOL. LXXII. MAY 16, 1913. No. 1,851.

ELECTRICAL REVIEW.

Vol. LXXII.] CONTENTS: May 16, 1913. [No. 1,851.

	Page
The Government and Trade	793
Foreign Trade in April	794
The I.E.E. in Paris	794
The Electrical Industry in France (*illus.*)	795
Electric Laundry Irons (*illus.*)	797
Royal Society Conversazione (*illus.*)	798
Correspondence :—	
The Prevention of Accidents in Electric Lifts	799
The Preservation of Creosoted Poles	799
Village Lighting	799
Combined Luminous Radiators and Convectors	799
Marconi Advisory Committee's Report	799
Business Notes	800
Notes	810
City Notes	812
The Betulander Automatic Telephone System	813
The Commercial Production of Oxygen and Hydrogen (*illus.*)	816
Stocks and Shares	824
Share List of Electrical Companies	825
New Works of the Cie. Parisienne de Distribution d'Electricité (*illus.*)	827
Proceedings of Institutions :—	
The "Point Fives"	828
Economies in the Use of Electric Power	829
Faraday Society	830
Phase Advancing	831
Standard Clauses for Street Lighting Specifications	832
New Electrical Devices, Fittings and Plant (*illus.*)	833
Legal	835
Foreign and Colonial Tariffs on Electrical Goods	835
New Patents Applied For, 1913	836
Abstracts of Published Specifications	836
Contractors' Column	Advertisement pages xxvi and xxviii

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE 1—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, 19s. 6d.; Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; The Mining and Engineering Review, 16, Palmerston Buildings, Queen Street.
BERLIN: Asher & Co., Unter den Linden; Speyer & Peters, Unter den Linden 43, N.W. 7.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: The Mining & Engineering Review, 90, William Street Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: The Mining & Engineering Review, 2, Hunter Street; Gordon and Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch, 132, Bay Street.
WELLINGTON, N.Z. Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

THE UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1913 EDITION.

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

THE GOVERNMENT AND TRADE.

THE reader has long been familiar with criticism of the inefficiency of the British Consular service considered from the standpoint of trade, and with the demand for a Minister of Commerce. It is thought that, however admirable the Consul may be as a diplomatic official and a gentleman, he is not always a success as a representative of British manufacturers—ability, opportunity and inclination, one or all, may be lacking. The Government has been urged to spend money with a more liberal hand upon a reorganised Consular service, upon Commercial Attachés—now too few—and upon special Trade Commissioners. For what has been done in recent years by way of improvement in these directions and for the increased usefulness of the Board of Trade Commercial Intelligence Department, we must, of course, be grateful, and for the announcements of the past week we are especially so seeing that they are an indication that now that the Government has, in a sense, got other matters out of the way, it is willing to do something in response to suggestions from those responsible for the commercial affairs of the nation. Of course, we must not expect to get all that we ask for—there is to be no Minister of Commerce known as such, nor is there to be a million a year allocated for more efficient British governmental trade representation in the various quarters of the globe where it is needed. But, thanks to the sitting of a Royal Commission on the Civil Service, we are to have a Second Secretary of the Board of Trade, and thanks to the consideration of the Foreign Office, there is a prospect of closer co-operation resulting between the Commercial Attachés already in office and the Chambers of Commerce.

Sir H. Llewellyn Smith, the Permanent Secretary to the Board of Trade, in his evidence given last autumn before the Royal Commission already mentioned, expressed the view that the danger of the Board lay in its size, and he appeared to favour the appointment of a deputy or colleague to relieve the congestion in the department, preferring that course to a sub-division of the whole office. The President of the Board now announces the appointment of a Second Secretary—Mr. G. Stapylton Barnes, C.B., who is at present Comptroller-General of the Labour Department. The Labour Department of the Board is to be sub-divided, with responsible directors for Labour Exchanges and Unemployment Insurance, and for labour statistics.

It will be recalled that before ever such things as Labour Exchanges and Insurance were brought within the region of practical politics, it was strongly held in industrial and trade circles that the Board was overburdened with duties which ordinarily would hardly come under the category of trade, to the exclusion of pressing matters which were of direct trade concern. What the commercial world will, no doubt, be interested to know, is whether the present re-arrangement will merely lead to relief of the kind mentioned, or will be followed by an enlargement of interest in trade affairs, thereby in some measure satisfying the desire for a Ministry of Commerce.

The second announcement to which we allude relates to proposals which have been put before the Associated Chambers of Commerce by the Foreign Office. These pro-

posals, according to the *Times*, have for their object a closer co-operation between H.M. Commercial Attachés and the Chambers of Commerce, and Sir Edward Grey recommends them for favourable consideration.

We fear that Consular officials and manufacturers have been strangers to each other and to each other's doings far too long. The reasons may be many. Trade may be *infra dig.* to some men still, but that attitude is to-day a sheer absurdity, and should not exist; firms may have lost confidence in Consular representatives, though there again unjustifiable prejudice has not been lacking. The many other reasons need not be stated now, we believe they are familiar enough, but one thing that we must say on this point is that when, in our own experience, any desire has been shown by manufacturers to place Trade Commissioners in possession of specialised information that would assist them in watching over British Trade interests in other countries, they have not been slow to take advantage of the opportunity.

What Sir Edward Grey is now stated to believe is that better results could be obtained if our commercial attachés "were to receive some guidance from British manufacturers and merchants interested in foreign markets," and, as a first step in that direction, he suggests a standard classification of the trades and industries of this country which can be uniformly adhered to in official reports. A second suggestion is that leading questions be drawn up by experts in regard to all the principal industries in the country, especially those affected by foreign competition. It is not proposed that this classification shall extend to matters of detail, and it is thought that a certain number of the more important branches might be grouped under a few broad headings, one of which is: "Machinery.—Electrical Motors, Dynamos, &c." An official of the Board of Trade Commercial Intelligence Department has prepared a set of questions (relating to the woollen and worsted trades) as a model, and it is believed that, if similar sets could be drawn up for other leading industries, they would prove of the greatest assistance to our national representatives abroad in conducting investigations and preparing reports.

Now, if there is any trade which, from the mouths of its more militant members, has expressed itself as suffering seriously under foreign competition, it is the electrical. Therefore it will be desired that the electrical engineering industries shall co-operate in preparing information for the "guidance" of Commercial Attachés. And if there is any journal which has shown an eagerness for Consular officials to be fully and accurately informed regarding the abilities of British manufacturers, it is the Electrical Review. One part of our effort in this direction has been the sending of this journal regularly to a large number of Consular offices abroad, and the conduct of a voluminous correspondence with many hundreds of them urging the interests of British electrical firms upon their attention. Between three and four years ago, in a series of articles on this and other trade questions, we went so far as to suggest that those destined to go abroad as expert trade representatives of this country should be made intimately acquainted with our great national engineering and other industries by touring among them and seeing them. We might like them to be engineers, but where that is not possible we would have men with minds trained to conduct expert observations and freely imbibe just the right kind of information relating to technical industries. Nothing in the way of official documents, statistics, records, and so forth—essential as these are for purposes of reference—could make so forceful an impression as seeing things at first hand. Of course all our Consuls could not be brought home to make provincial expeditions for their education, but in the case of new appointments and of officials visiting this country the principle might be adopted and carried out on a small scale. The idea running through this suggestion is the same as that prompting the proposal of Sir Edward Grey—the better equipment of our Consuls and others in responsible positions for the furtherance of our trade interests outside these islands.

The Electrical Review, of course, heartily welcomes the new movement, and it notes that the Council of the Associated Chambers of Commerce has agreed to advise the Foreign Office on the classification and compilation of sets of suitable questions, and to appoint committees to deal with each request as received.

We yield to none in our admiration for the activities of the Chambers of Commerce in some directions, but we may be excused if we question how far these Chambers, either through their central organisation or locally, can be fairly regarded as able to speak for the electrical and other engineering industries. There are electrical organisations which could indicate broadly and with accuracy what electrical firms want to know, and these, if so inclined, might be allowed to co-operate with the Chambers in order to ensure that this matter should be put on a proper footing for the future.

Foreign Trade in April.

The official figures as published last week show that, compared with the month of April last year, there was an advance of 2½ millions sterling in imports and of over 10 millions sterling in exports. In the total exports the items coal and iron and steel together show an advance of more than £6,000,000. It has to be remembered that the coal strike was in progress last year, and the working days were fewer, as Easter came in April in 1912 and in March this year. The electrical and machinery figures are as follows:—

	Month of April, 1913.	Increase or decrease.	Four months, 1913.	Increase or decrease.
Imports.	£	£	£	£
Electrical goods and apparatus, excluding machinery and insulated wire	131,806	+ 12,255	506,145	— 24,667
Machinery	678,239	+ 96,184	2,512,131	+ 297,593
Exports.				
Electrical goods and apparatus, excluding machinery and insulated wire	376,029	+123,490	1,916,285	+ 473,008
Machinery	3,344,594	+786,828	11,934,657	+1,564,421

The I.E.E. in Paris.

On Tuesday next a large party of members of the Institution of Electrical Engineers, together with a considerable number of ladies, will journey to Paris, to meet their *confrères* of the Société Internationale des Electriciens—a body which was founded in 1883 after the first international electrical congress, held at the Paris Exhibition of 1881, and which has since maintained its reputation as one of the most eminent societies of its kind in the world. No similar visit has taken place since the Paris Exhibition of 1900, and as vast changes and developments have taken place in the interim, in the supply of electricity to Paris and the electrification of many of the railways and other means of transit, there will be much to see and many useful lessons to be learnt from the achievements of our French friends.

Some idea of the progress that has been made in France in recent years, in connection with the electrical industries, may be gathered from the article by M. Dary, which is commenced in this issue; we print also an abstract of an article in the *Technique Moderne*, describing recent works erected by the company which has taken over the supply of Paris from its six predecessors. But it is not only in the capital that France has gone ahead; her vast natural resources in the shape of waterfalls are being rapidly developed, especially in the south-east, where they are fed by the glaciers, to which the felicitous title of "white coal" has been given. The ice, however, is better than coal in that it is perpetually renewed, and thus this source of power is inexhaustible.

As usual, a full programme has been arranged—too full, in all probability; but that is the invariable rule on these occasions, and in any event, those who prefer to do so can "skip" items. We are certain that our friends of the Société will give the visitors a thoroughly good time, and we rejoice to think that they will fraternise not merely as a matter of form, but with that cordiality which is born of a sincere and unreserved goodwill. The visit cannot fail to strengthen the bonds of friendship between the two nations, and especially between these two great engineering Institutions.

THE ELECTRICAL INDUSTRY IN FRANCE.

By GEORGES DARY.

The last few years have witnessed a marked business revival in France, which has extended generally to all industries and to the electrical industry in particular. Five years ago, in a series of articles in these columns, we were under the painful necessity of drawing attention to the lack of enterprise in connection with new industries that was then prevailing in France; what may be regarded as a general condition of debility and trepidity combined with a constant feeling of hesitation, prevented even those usually associated therewith from encouraging the promotion of serious undertakings, thus greatly hindering the development of the electrical industry. We were, however, also able, in concluding the series of articles mentioned above, to foreshadow the great forward movement the industry was bound to make at an early date, thanks to the perseverance of courageous pioneers, who, in spite of systematic official obstruction, and the difficulty experienced in securing anyone to take a financial interest in the schemes proposed, valiantly continued their way towards the desired goal. To-day their victory would seem to be complete, for the proofs we are able to offer in connection with the same are both numerous and varied.

In fact, from a financial point of view, the native fears which the French investor still held with regard to industrial undertakings have disappeared, and to this exaggerated fear quite a *volte face* has succeeded, almost without a period of transition, thus admirably demonstrating the character of the French for unreserved enthusiasm. The capitalist and the small investor have neglected Government stocks in order to buy shares or debentures in industrial undertakings, collieries, industrial financing companies, electrical undertakings, mines of all kinds, and the value of the shares is steadily advancing and with a regularly increasing market, the last batch of hesitating investors has been drawn in. On the other hand, too, and as an inevitable result, industrial undertakings which were already commencing to show renewed life, have developed an enormous activity as a consequence of the influx of capital and credit, with the result that there is just now quite a revival in industrial undertakings in France, the existing position, as compared with the past, being indeed exceptional.

From the point of view of outward appearances, the situation is extremely striking. In Paris the numerous lines of the Metropolitan, or underground railways, are approaching completion, and the number of passengers is increasing daily; then there is the extension and reconstruction of the large railway stations of Mont Parnasse and Saint Lazare; the electrification of the suburban railway lines, the increase in the number of trains, and the construction of new, better equipped, better lighted, and better heated bogie carriages. The improvement of the electrical distribution service, the reduction in the charges for energy, and the general use of metallic-filament lamps, which brought about a sudden increase in the number of consumers, have forced the electricity supply companies to greatly increase the plant at their generating stations. The Compagnie Générale des Omnibus de Paris has seen itself compelled to suddenly and totally transform itself, by getting rid of all its horse-drawn 'buses and replacing them, on all the different services, with speedy motor-'buses. Next, there has been the introduction of thousands of motor taxi-cabs, the relatively low tariffs charged for the use of the same having brought about the disappearance from the streets of the old horse-drawn cabs which continued to make a struggle for existence. The net result of all this is that within a space of two years life generally in Paris has become much more intense, and the traffic so heavy that the latter, according to recent statistics, now exceeds that of London.

In provincial France the industrial revival is no less marked. There is the frequent formation of new undertakings which, looked at from an electrical point of view, have as their object for the most part, the exploitation and utilisation of new waterfalls in the generation of electrical energy and the distribution of the same for lighting and power purposes in neighbouring towns. Furthermore, new electric railways are being constructed, while existing railway companies are adopting electric traction on sections of their lines. Finally, there are many huge projects which are being either considered, are being got ready for execution, or are in course of being carried through, such as tunnels through the Pyrenees, the utilisation of the water power of the Upper Rhone river with the view of supplying electrical energy to Paris, &c. From among this large number of new installations and projects, we shall select the most characteristic, the most striking from each class, from an electrical point of view, with the object of bringing home to readers the reality of the unexpected progress that has been achieved.

We shall, therefore, summarise the new electrical distribution systems in Paris, the projected utilisation of the River Rhone, the electrification of the Paris suburban railways, and the modernisation of the tramways, the new Franco-Spanish electric railway in the Western Pyrenees, and, finally, the latest examples of central stations in the Pyrenees and in South-Western France.

If we examine the actual position of the electricity supply of Paris, we find that the transitory *régime* which commenced in 1908 will come to an end at the termination of the present year. In other words, the six old concessionnaires which divided Paris into as many sections, and which, in their dealings with the Paris Municipality, are represented by the Comité de l'Union des Secteurs Electriques Parisiens, will come to the end of the period of their concession on January 1st, 1914. What may be termed the definite *régime* will then commence, and will continue until June 30th, 1940; during this term of years, the work of supplying Paris with electricity will be entrusted to the Compagnie Parisienne de Distribution d'Energie Electrique. The contract may be determined by the Paris Municipal Council on June 30th, 1924, or at the end of any subsequent two years, subject to two years' notice being given. By the agreement, the Compagnie Parisienne has to establish two generating stations to meet the demands of consumers, one in south-west Paris (Issy), and the other in north Paris (Saint Ouen). Both stations are in communication with the railway system, and are located on the banks of the River Seine. The capacity of each plant must be 25,000 KW. as a minimum. The northern station may be extended, at the wish of the Paris Municipal Council, to 50,000 KW., the Municipality also reserving the right to meet future increased demands by utilising current transmitted from hydro-electric plants at a distance, in place of extending the northern generating station. In any case, the two plants above mentioned must be ready to supply current by January 1st, 1914, the guarantee to this end deposited by the concessionnaires being £80,000.

The agreement arrived at between the company and the Paris Municipality may be summarised as follows:—The transitory period from 1908 to 1913 was agreed to in order to give the new concessionary company time to re-establish the supply system, and to place its service on a satisfactory basis. The company, therefore, proceeded with the establishment of the two plants above mentioned. The northern one, at Saint Ouen, has a capacity of 75,000 KW., and the south-western one, at Issy-les-Moulineaux, a capacity of 25,000 KW., 10,000 KW. generating sets being, as far as possible, employed.

According to the agreement, the company will have a monopoly as regards lighting, but not for the supply of current for power purposes, in which department competition is very probable, as there is already a proposal to form a company, with a capital of £2,000,000, for the supply of electrical energy for power purposes, in workshops and industrial establishments, at a lower price than is charged by the Compagnie Parisienne. The suburbs of Paris would also be supplied with current for power purposes by other companies. A scheme is under consideration, too, in the Nord Department of France for the establishment of generating stations for the supply of current to a considerable area, extending right up to the gates of Paris. One of these stations will be established at Creil, another at Laon, and it is also proposed to transmit electrical energy from generating stations established directly in connection with collieries in the Nord and Pas de Calais Departments.

Returning, however, to the work which is being carried out by the Compagnie Parisienne in readiness for the supply

from January 1st next, an inspection of the plans shows that the reorganisation and extension of the system have been prepared with a view of obviating the considerable expense which would have attached to the complete unification of the system, and of avoiding the opening of trenches in all the different thoroughfares, with the object of reducing to a minimum the disturbances to the supply service and the dislocation of traffic. The programme of work, which is on the point of completion, comprises three distributing areas or zones: First, the centre zone—densely populated and with a heavy consumption of energy; supplied with continuous current on the three-wire system. Secondly, the left bank and western zone—population relatively thinly distributed and only moderate current consumption: supplied with single-phase alternating current at 3,000 volts pressure. Thirdly, the north-east, east and south-east zone—comparatively thinly populated; supplied with two-phase alternating current at a pressure of 2 × 110 volts.

It may here be mentioned that the two-phase current is generated at a pressure of 12,300 volts, and that in view of the wide distribution area it was necessary to establish a number of sub-stations, or to alter those already existing.

For the first zone, supplied with continuous current, the establishment of 11 sub-stations was provided for, where the high-tension alternating current is transformed to low-tension continuous ready for direct use by consumers. The equipment at these sub-stations has been so arranged that it can, up to January 1st, 1914, be supplied with current from the existing Secteur generating stations. Six existing sub-stations have already been suitably altered to meet the new conditions—viz., the Bondy, Trudaine, Saint Roch, Mauconseil, Sévigné and Clichy-Puteaux sub-stations. The other five newly established are those known as Bergère, Pasquier, Temple, Voltaire and Saint Antoine.

The second zone, supplied with alternating current at 12,300 volts pressure, comprises four new sub-stations, where the initial voltage is reduced to 3,000, which in turn will be transformed down to 110 volts by means of transformers installed in the consumers' premises. These sub-stations, two of which—Muette and Sevres—are already completed, while two, Gobelins and Les Ternes, are nearly ready, will share the load on the phases of the primary two-phase network connecting them to the supply stations.

Finally, the third zone will comprise five coupling centres, intended to divide up the high-tension current from the generating stations between 120 transformer stations, where the voltage will be reduced to 2 × 110. The five centres are Doudeauville, Lumière, Menilmontant, Charonne and Daumesnil.

The supply mains will comprise:—(1) The primary mains connecting the generating stations with the sub-stations and coupling centres, having a length of 281 miles; (2) the feeders connecting the sub-stations with the conductors supplying the consumers, about 188 miles of which are already laid; and (3) the conductors supplying consumers' installations, and which, already in existence, have been converted to either the three or five-wire system.

As regards the tariff for electricity supply, which is on a basis of 7d. per KW.-hour for lighting and 3d. for power purposes, this is to be reduced to 3d. for lighting and 2d. for power.

The question may here be asked: Whether, with the numerous additions of electric tramways, or the new and numerous electric lines connected with the metropolitan and suburban railways, the thousands of new consumers of current for lighting and power purposes, the generating plants provided for by the agreement will be sufficient to supply Paris with electrical energy. The question may fearlessly be answered in the negative. As a matter of fact, with the Metropolitan Underground Railways complete, a supply of 100 million KW.-hours will be required; the tramways and other services will require an equal amount; the suburban railway system will need 125 million KW.-hours; for power purposes in Paris, 200 millions; for lighting in Paris, 60 millions, and for lighting in the suburbs, 100 millions, or a total of 685 million KW.-hours; that is to say, double the present consumption in Paris. It will therefore be impossible for the generating stations in the French capital to provide for this enormous consumption. Consequently recourse will have to be had to an outside supply of electrical energy, which, generated at a distance, shall be cheap, and transmitted to Paris by overhead conductors. The utilisation of the water-power of the River Rhone is a scheme that meets the case, and which has resulted in the project of which details are appended.

The utilisation of water-power is being so much regarded as the future source of electrical energy, that for some time past the most competent authorities have been drawing up statistics with regard to the hydraulic resources possessed by France, just as a business man who is contemplating starting a new undertaking counts up his available capital. France, from this point of view, is a rich country, for, according to figures issued in 1910 by the Ministry of Agriculture, there is a total of utilisable water-power available of no less than 9,200,000 H.P., divided approximately as follows:—Northern Alps, 2,000,000 H.P.; Southern Alps, 2,600,000 H.P.; Vosges and Jura, 1,800,000 H.P.; Centre and Pyrenees, 2,800,000 H.P.

By scanning the following extract from the work recently published by M. de la Brosse as to the capacity of the hydro-electric stations that have been established in the Alps, readers of the REVIEW will be able to gather an idea of the amount of hydraulic power in France that has so far been utilised and the enormous quantity that is still available:—

Rivers and Streams.	H.P.
Drause	1,100
Arve	54,880
Fier	3,400
Guiers	14,760
Rhone, Yonage	22,000
Isère and tributaries	260,000
Drôme	670
Lez	90
Durance	93,000
Argens	3,800
Siagne	8,600
Loup	3,200
Var	8,350
Roya	275
Total	474,125 H.P.

The purpose for which this power is utilised is approximately as follows: Metallurgical industries, 210,000 H.P.; power and lighting distribution, 155,000 H.P.; chemical works, 60,000 H.P.; paper mills, 30,000 H.P.; traction, 10,000 H.P.; and flour mills, &c., 8,000 H.P.

As regards the project to utilise the water-power of the Upper Rhone below Geneva, which was accepted by the Government in September, 1911, this was drawn up by Messrs. Harlé, Blondel and Mähl. It is not the first scheme, nor yet the only one, as, for some years past, the subject has occupied many minds, but has long been regarded as an idealist's dream. The great progress that has been made by electrical science has, however, converted the dream into a possible reality, which, it is hoped, will shortly be put into execution.

At the present time there only exists a single very modest plant, at Bellegarde, near Génissiat, where it is contemplated to establish the projected barrage, or dam. The Société de Bellegarde had also drawn up a similar project of transmitting electrical energy to Paris, and proposed to utilise about 270,000 H.P. We shall, however, not deal with the last-named scheme, but will occupy ourselves with the one which has been officially accepted and which has the greatest chances of success.

As it emerges from Lake Geneva, the River Rhone finds itself confined in a deep valley, into which it rushes as a veritable torrent. The flow there is considerable, the Lake serving as a reservoir, and to regulate its volume. Messrs. Harlé, Blondel and Mähl propose to establish a dam at Génissiat, 246 ft. in height, which will convert the upper valley into a lake, having an area of, approximately, 940 acres, a length of about 14½ miles, and a capacity of over 1,765,500,000 cb. ft. The hydraulic power available would range between 80,000 and 350,000 H.P. The establishment of the plant would also solve the question of the navigation of the Rhone as far as Geneva, by means of a series of dams and a branch canal, which would encompass the generating station.

In order to ensure the stability of the dam, it will be necessary to go down to solid rock, which has been found at a depth of 88½ ft. The stream of water being 11½ ft. deep, the foundations will have to extend to a depth of just over 100 ft. On the other hand, the solid character of the banks will enable the ends of the dam to be strongly incorporated therewith. The generating station to be established at the foot of the dam is designed for an average capacity of 240,000 KW., divided into 24 sets of 10,000-KW. turbines. It is hoped, however, to reduce the number of sets to 16 by increasing the capacity of each to 15,000 KW. The turbines will run at 250 revolutions per minute, and will drive three-phase, 12-pole alternators giving current at 12,000 volts pressure. For transmission purposes, the voltage of the current will be raised to 120,000 in a transformer sub-station, located at a point 252 ft. above the generating station, and at a distance of about 720 ft. The continuous-current exciters (750 KW. at 160 volts) will be coupled to vertical-spindle turbines. The generating units will be divided into independent groups. All the controlling gear

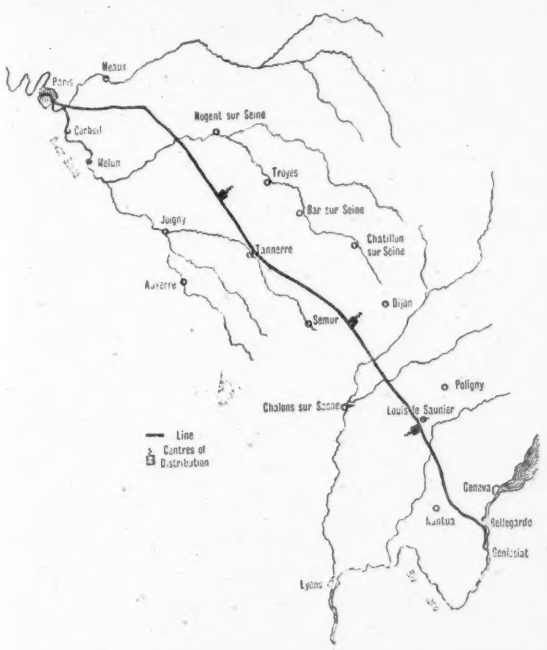


FIG. 1.—RHONE-PARIS TRANSMISSION LINE.

for the general running of the generating station will be operated from a distance. The cables leaving the alternators will be provided at their ends with oil circuit-breakers. The staff at the generating station will be able to cut off the current, but not to re-establish the circuit, this being reserved to the central establishment.

Three distinct services will be provided for—the 120,000-volt service for Paris; one of 30,000 volts for the Departments in the neighbourhood of the station; and a 12,000-volt one for electrochemical establishments.

Four lines, transmitting a total of 100,000 KW., will connect Génissiat with Paris. Each of the lines will comprise three cables. They will be divided into two groups, and, in the distance of about 220 miles, three distributing centres are provided for, as shown in the accompanying map (fig. 1)—one near Louis-le-Saulnier, the second between Semur and Dijon, and the third between Joigny and Troyes. These centres, separated by a distance of about 60 miles, will furnish a supply to well-populated industrial districts.

The transmission lines will be supported on steel columns at distances of from 492 to 656 ft. It is hoped to utilise aluminium conductors of 20 mm. diameter, and, with an initial voltage of from 100,000 to 120,000, the loss at Paris is estimated at 20 per cent. The Harlé-Blondel-Mähl scheme will cost about £4,000,000, and it is expected that it will be possible to supply energy at a reduction of 20 per cent. on the tariff established under the new 1914 *régime*.

(To be continued.)

ELECTRIC LAUNDRY IRONS.

BY G. H. ELLIOTT, A.M.I.E.E.

I AM greatly interested in the correspondence relating to troubles encountered with electrically heated irons in laundries and other workrooms, since I have had considerable experience with this class of apparatus.

The cord trouble, I believe, is more a matter of proper suspension than any other thing, and where what I call the "floating cord system" is adopted, as in the laundries of Messrs. John Barker (where, as stated in Mr. Carr's letter on April 25th, the irons have run for two years without trouble of any kind), of Messrs. Eastman & Son (where 300 electric irons are in use), and in many other workrooms with which I am acquainted, the trouble with the cords is negligible. This system is shown in the accompanying illustration. A little wooden ball is hung by a fine twine from the ceiling over the centre of the ironing table. The fixed wiring is taken to a ceiling rose on the wall, or on a suitable support about 4 ft. above the level of the table. The flexible cord is taken from this rose, through a hole in the ball, and drops thence to the iron. The ball should be free to swing over a distance at least equal to half the travel of the iron. Then, as the iron is moved about the table, the ball swings in unison with it, and the cord floats without strain, and will be found to have a really long life. Where the head room is limited so that the ball cannot swing freely, it is an advantage to hang the ball on a light spiral spring in order that the desired amount of motion may be given. The hole in the ball should be a snug fit on the cord, and the cord adjusted so that there is no loop or kink between it and the iron; a loop is a certain source of trouble.

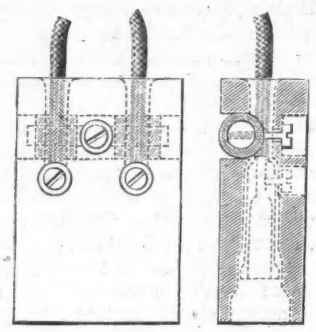
It is my experience that the cord should be as light and flexible as possible. Nothing is better than good vulcanised twin 70/40. A great fault with most electric irons is the wire cage and bush that is attached to the connector. In workrooms the cord has always to withstand a very consider-

FLEXIBLE SUSPENSION FOR LAUNDRY IRONS.

able amount of bending and straightening, and this is bound to fatigue the material after a greater or less time, even with proper suspension. Where a cage is fitted, the bending takes place at the top of the cage, especially when a bush or knob is fitted there; since the two poles are twisted closely together at this point, there is a grave risk of a "short" between the two—one cord in breaking is quite liable to fire across to the other and create serious trouble. In the connector usually fitted to the "Hot-Point" iron this shorting is avoided by keeping the two poles well apart at

D

the trouble point. A cord grip, consisting of a steel bar with fibrous insulating collars, is fitted near the top of the connector. The two cords coming from the sockets are passed under this bar, and are gripped between the insulating collars and the porcelain body; the braiding itself, or preferably a cotton whipping wound over the braiding, is gripped, and there is no strain on the copper. The porcelain above the cord grip has two holes or tubes formed in it, and the weakest spot on each cord is located within these tubes. Then, if the cord is allowed to remain in use so long that it wears out and breaks, any arc that may be formed occurs



Details of Cord Grip.

inside the tube and is damped out, the two poles are kept well apart, and serious trouble is a most improbable event. "Ironical" mentioned trouble caused by poorly designed connections between the terminal pins and the elements. In the irons I am best acquainted with, these connections are made by forming a three-wire loop of the actual heavy gauge wire of the elements themselves, and securing this loop under big hexagon nuts. I understand that this arrangement is quite free from trouble.

I should greatly appreciate seeing a few more records of running cost published. Factory owners have a tendency to multiply the nominal wattage by the number of working hours per week and to declare that electric irons are ruinously expensive. The actual figures, I believe, are strongly in favour of electric irons. For instance, a report from the New York Edison Co. was published in this paper a week or two ago, giving the average consumption of irons in tailoring factories at 350 kw.-hours. This is an amount that is, I believe, much appreciated by central-station engineers, and at 1d. per unit it is quite capable of bearing comparison with gas. Should any readers of the Electrical Review have similar figures, I believe that many other engineers would be pleased to see them.

ROYAL SOCIETY CONVERSAZIONE.

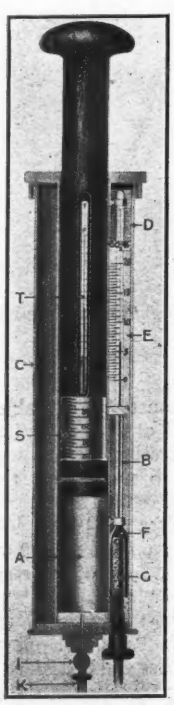
On Wednesday last week the conversazione of the Royal Society took place at Burlington House, the guests being received by the president, Sir Archibald Geikie. There was not a large proportion of electrical exhibits, partly, perhaps, because marked attention is being devoted to apparatus for use in aeronautical investigations. For instance, Mr. M. O'Gorman showed a collection of seven instruments to indicate or record the speed, path and distance traversed by aircraft, to measure the pull on a wire without disturbing it, &c., some of these being electrically operated. The Cambridge Scientific Instrument Co., Ltd., showed a yaw indicator, and the National Physical Laboratory an apparatus for the rapid determination of the lifting power of samples of hydrogen.

Prof. J. T. Morris exhibited a new instrument for an allied purpose—the measurement of the velocity of wind—in this case applied to the distribution of velocity round a circular rod at right angles to a current of air produced by a fan in a wooden trunk. The device consists of a Wheatstone bridge made up with alternate arms of platinum and manganin, the wires being stretched axially along the rod. At normal temperature the bridge is out of balance; a current is passed through it, and a calibrated indicator takes the place of the usual galvanometer. The change in temperature and resistance of the platinum wires is a measure of the velocity of the air which cools them, and can be determined by the reading of a milli-voltmeter. Another method of using the instrument is to vary the current so as to bring the bridge into balance for a given velocity; the square of the watts used in the bridge wires is then nearly proportional to the velocity of the wind. With this apparatus the movement of air can be determined quite close to and all round an obstruction, and it is not necessary to find the direction of the wind before a measurement can be made—as in the case of the Pitot tube.

Mr. F. W. Jordan exhibited the sensitive convection radiometer and thermo-galvanometer, which he described before the Physical Society a few months ago;* this instrument indicates the strength of a convection current of air in a partitioned chamber, set up by very feeble sources of heat; a deflection of 5·4 mm. is obtained on a scale 1 m. from the mirror with 10^{-6} calorie per second. As shown at the Conversazione, it was measuring the heat evolved by a minute quantity of radium.

Prof. J. Norman Collie and Mr. H. S. Patterson showed experiments bearing upon their recent observation of the presence of neon and helium in hydrogen, after the passage of an electric discharge through the latter at low pressure.

A novel instrument was exhibited by the Underfeed Stoker Co., Ltd., in the shape of a pocket CO_2 thermoscope, with which the percentage of carbon dioxide present in flue gases can be determined in a few seconds, and to a high degree of accuracy. The principle employed is that of absorption of the CO_2 with caustic soda, the resulting chemical reaction giving rise to an evolution of heat which is proportional to the quantity of CO_2. The apparatus consists of a cylinder fitted with a piston, by means of which



Section of CO_2 Thermoscope.

a measured quantity of gas can be drawn from the flue or chamber to be examined, two thermometers, and cartridges containing pulverised caustic soda. It is shown in section in the accompanying figure, where A is the cylinder, C an outer jacket, B the testing thermometer, and G the cartridge. An auxiliary thermometer T enables a correction to be made for the temperature of the instrument by regulating the stroke of the piston with the scale S engraved on the piston rod, so that the correct volume of gas is always drawn in.

* Electrical Review, November 15th, 1912.

To use the instrument, a sample of gas is drawn into the cylinder, and the tap I is closed; one of the little cartridges is pricked at each end to enable the gas to flow through it, and is attached to one end of a rubber connection, the other end K of which is connected to the nozzle of the tap. The cartridge is inserted into the hollow bulb F of the thermometer, and after adjusting the zero of the movable scale E to the top of the mercury column, the piston is pushed in, driving the gas through the cartridge. The percentage of CO_2 present is then read off directly on the scale E, which can be seen through a slot D. It will be seen that the process is extremely simple, and can be carried out by any intelligent person without skill in manipulating chemical apparatus.

The Cambridge Scientific Instrument Co., Ltd., showed the "Apophorometer," an instrument designed by Prof. J. Joly, for easily obtaining sublimates at high temperatures. It consists of a thin ribbon of platinum; the substance to be tested is placed on the ribbon in the form of a pinch of powder, and the ribbon is enclosed between two watch glasses. On passing a current through the ribbon and gradually increasing its strength, the various sublimates are driven off in turn, and by noting the current in each case the temperature of the ribbon, previously calibrated, can be ascertained. By this means, the analysis of complicated minerals is greatly facilitated. Other exhibits were a barometer with a dial instead of a vernier, and an electrical device for recording the amount of opening of the stomata on a leaf.

The most interesting exhibit was that of the Sperry Gyro Compass, in which the gyroscopic element is suspended from a stranded wire, the top of which is held in a frame surrounding the sensitive element and made to follow it by a system of electrical contacts controlling a motor. The system comprises a master compass which is placed in a well-protected position in the ship, and repeater compasses which are operated by the master compass in various parts of the ship. The gyrostat is driven by three-phase currents, and takes up its definite position in about four hours from the time of starting the motor.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Prevention of Accidents in Electric Lifts.

I am afraid that Mr. W. S. F. Cooper's acquaintance with electric lifts is somewhat limited. If he will make inquiries he will find that combined electrical and mechanical locking gear has been successfully applied to the gates of lifts for several years past.

With an electrically-controlled lift nothing is easier than to put the electric portion of the lock on each landing gate, and frequently also on the cage gate, in series with the controller, so that current cannot be given to the motor until every gate contact has been made, or, in other words, until every gate has been closed.

Hydraulic lifts can be protected in a similar manner by arranging the electric locks in series with a solenoid rope gripper fixed on the top of the cage. Whenever the cage is at any floor, and the landing gate open, the gripper grips the rope and prevents its being operated until it is released by the closing of the gate.

Mechanical locking alone is insufficient protection, for, as a rule, it means that the cage can be moved from the landing with any gate open.

A. R. Leaver.

London, S.W., *May 7th*, 1913.

The Preservation of Creosoted Poles.

I am obliged by the reply of "Communicated" to my letter, and fear I read his article, which appeared in yours of the 18th, rather hurriedly. I quite agree with this. I take it he does not think that a normal injection of creosote into wood makes it brittle, which was all I took exception to. I have no doubt that in the case of some large users it is impossible to arrange for notching and boring before creosoting, but we find that most other large users, as electrical contractors, power companies, &c., do endeavour to plan their lines out, and have such work done, as far as possible, before creosoting.

Christopher Wade.

Hull, *May 6th*, 1913.

Village Lighting.

I read with interest your note on "Village Lighting," especially as I have just successfully equipped a country residence in the Dukeries with 12-c.p. lamps fed from portable batteries. The cost (initial) is very low, and maintenance runs about ·5 of a penny per hour. This may interest your correspondent.

John Morley.

Mansfield.

Combined Luminous Radiators and Convectors.

I notice in the current issue of the Electrical Review a description of the "Lynton" radiator, in which an electric heating lamp and heating elements are employed, and this is claimed to be a new type of radiator.

I would call your attention to enclosed Patent No. 15,591 of 1902, which covers a combination, in one frame, of the use of electric heat lamps and non-luminous heating elements. The Dowsing Radiant Heat Co., Ltd., have manufactured these combined radiators for the past 10 or 12 years, and they have proved very successful.

Radiators of this description would infringe my patent, and I may say that all necessary legal proceedings will be taken by my company to uphold their rights.

For the benefit of those who may not be acquainted with this patent, the claims are as follows:—

1. An electric stove comprising in one casing one or more electric glow lamps and one or more heating resistances, adapted to be connected either separately or otherwise to a source of electric current substantially as described.
2. An electric stove comprising electric glow lamps, and a resistance coil or coils disposed respectively in front of or behind a reflector, and adapted to be connected either separately or otherwise to a source of electric current, substantially as described.
3. An electric stove comprising in one casing, one or more electric glow lamps, and one or more resistance coils, adapted to be connected either separately or otherwise to a source of electric current, opening in the casing and passages leading therefrom to the heating resistances and lamps substantially as described.

May I add that this combined form of electric radiator, which we call our Radio-Convector, is of very great value, as the good points of both types of radiators are included in this design.

The Dowsing Radiant Heat Co., Ltd.,
H. J. Dowsing, *Managing Director.*

London, W., *May 9th*, 1913.

Marconi Advisory Committee's Report.

I am not interested in any wireless scheme, but it strikes me as odd that no mention is made of the fact that Australia has not adopted the system favoured by the British Government; and yet the Australian system is effective over long distances. The same remark applies to the systems in use in Germany, France and in the United States; and, as an outsider, I cannot see wherein the so-called "Marconi" system is superior. There are thousands of capable amateurs who now receive signals from every part of the world, and the number of senders would also be very large if licences could be obtained. So there cannot be any great difficulty in the business!

Anti-Humbug.

London, *May 12th*, 1913.

[It is to be regretted that our correspondent was not invited to sit on the Advisory Committee in the first instance, instead of being obliged to take the initiative; his "facts" might have been useful to the members. They are certainly new to us.—Eds. Elec. Rev.]

BUSINESS NOTES.

Consular Notes.—Congo.—The British Consul in the Congo, in a recent report, states that wireless telegraphy had been established between the following places up to June 30th, 1912 :—Stanleyville and Lisala, 275 miles; Stanleyville and Lowa, 132 miles; Lowa and Kindu, 110 miles; and Kindu and Kongolo, 184 miles. Brazzaville, the capital of French Equatorial Africa, is in communication with Lisala, 610 miles further up the Congo, and even with Stanleyville, 740 miles distant. Kindu and Lowa stations succeeded in communicating with Moanza on Lake Victoria, 453 miles distant. Atmospheric conditions on the Congo are not favourable to wireless telegraphy, the air being often highly charged with electricity, and the strong sunlight affecting the passage of the ether waves. Stations with wave lengths under 1,200 yards fail after 6 a.m., and only succeed at night. Two stations, Lowa and Kindu, with wave lengths of 1,700 yards, however, have been found to operate equally well during the day. It is proposed to establish a high-power wireless station at Lusambo in the Kasai, which, owing to its central position, will be able to communicate with all the other Congo wireless posts. Stations are also contemplated at Niangara on the Upper Uele River. The powerful British station at Aden, able to send messages 2,000 miles, will be able to communicate with Niangara, and that with Stanleyville, Brazzaville and Boma, thus effecting communication across the Continent. Wireless communication between Boma and Banana is steadily maintained, and Banana can communicate with Swakopmund. Connection with Coquilhatville, the terminus of the up-river land telegraph line from Boma and Stanleyville, has not been satisfactorily established so far on a regular basis, but is likely to be soon effected.

Steady progress is being made in pushing forward telegraph service. All the various new railways under construction carry the telegraph along as they proceed. A second line is being laid between Leopoldville and Coquilhatville to facilitate the service. Elizabethville and the frontier at Sakania have been linked, and a line is to be run from the former to the Star of the Congo mine. The Katanga line is connected with the telegraph network of South Africa, and international communications are assured by an agreement with Rhodesia. On January 18th, 1912, a convention was signed with Portugal for the erection of a line between Matadi and Noqui—five miles. Noqui, a Portuguese Angola port in the Congo, is connected with Loanda, where the Eastern Telegraph Co. is linked by cable with the world *via* St. Vincent or Teneriffe. Connection with Lindu is also available by way of Brazzaville and Pointe Noire, the rate being 5s. 8d. per word to the United Kingdom. Telephone services connect Boma, Matadi, Thysville, Kinshasa and Leopoldville. Installations connecting these places cost £10 per annum. Rates are 1s. 6d. to 2s. 6d. for five minutes' conversation. Telegraph receipts rose from £1,680 in 1910, to £2,129 in 1911. The colony has adhered to the International Telegraph Convention concluded at St. Petersburg on July 10th-22nd, 1875, and to the Radiotelegraphic Convention, of Berlin, of November 3rd, 1906, and was represented at the last Conference held in London in June, 1912.

Russian Far East.—The British Consul at Vladivostok reports that a central electrical power station has recently been opened there, and supplies light for streets and houses, and power for industrial purposes. An electric tram system 4 miles in length is now completed.

Paraguay.—Reporting recently on the trade of Paraguay, the British Consul at Ascencion points out that whereas the imports from most of the principal supplying countries showed an increase in 1911, as compared with 1910, the total imports from the United Kingdom appear to have suffered a relatively heavy decline, viz., from £539,115 in 1910, to £370,040 in 1911, a difference of £169,075, which is to be accounted for mainly by the falling-off in the imports of railway material. On the other hand, the German imports show a total increase of £135,255, which is made up of food stuffs, textiles, fancy goods, drugs, hardware, and articles imported free of duty. The imports from France and the United States also show a relatively large increase. That British trade is not (so far as can be gathered from the available figures) on the increase is, however, not surprising; it is, on the contrary, somewhat remarkable that it maintains its present level, because in the whole Republic there are only two British importing firms. It may be regarded as a tribute to the quality of British goods that they are largely imported by foreign houses and foreign agents, but at the same time the conclusion is irresistible that the British share in the total import trade might be still larger if a larger number of British houses were established in this country. Many more travellers and representatives are said to have been sent to Paraguay during the last year or two from other European countries such as Germany, France, Italy, &c., than from the United Kingdom; the British firms are also said not to give such easy terms of credit as the foreign ones.

In cases where goods are brought from samples, some Continental firms are said to send out larger assortments (which, other than those of textiles, are bought by the importers, subject to a large discount) than is customary with British firms, thereby facilitating a selection and affording a more precise indication to the exporter of the class of articles desired in this market. These small points are mentioned because Continental competition appears to be likely to grow still keener than at present. The German community is said to be continually increasing its numbers. They are occupied in trade and in many other ways, having apparently satisfied themselves that Paraguay offers a good field for their enterprise and activity, in relation to which the above quoted figures form a useful commentary. The United Kingdom imports practically no products of Paraguay, presumably because there are no British firms in the country exporting hides, tobacco, &c., like the German and Spanish firms. British trade-mark owners would do well to observe that the Paraguayan law has no cognisance of the fact that a mark may have been registered elsewhere, and consequently anyone, without adducing proof that he is the rightful owner or the owner's representative, may register any mark that has not already been registered in Paraguay, and by doing so he acquires the sole right to the use of it. The importer of goods bearing a mark that is not registered in Paraguay may therefore find it necessary in his own interest to register the mark.

Dissolutions and Liquidations.—The Adams Manufacturing Co., Ltd., Balfour House, Finsbury Pavement, London, E.C., and Bedford.—Pursuant to Sec. 188 of the Companies' (Consolidation) Act, 1908, a largely attended meeting of the creditors of the above was held on the 9th inst., at Winchester House, Old Broad Street, E.C. It was reported that the shareholders of the company had passed a resolution to the effect that it could not continue its business by reason of the liabilities, and that it was advisable that the concern should be wound up voluntarily. A further resolution was passed appointing Mr. Lewis Hardy, of Messrs. Hardy and Moritz, C.A., 8, Bream's Buildings, Chancery Lane, E.C., to act as the liquidator of the company. Mr. Hardy submitted a statement of affairs showing the position as at April 22nd last, the date of the resolution for voluntary liquidation. The statement disclosed ranking liabilities of £30,094, of which £15,382 was due to creditors on open account, and £2,058 in respect of bills payable. The bank were shown as unsecured creditors for £11,912, and in addition there were unsecured cash creditors for £742. There were also fully secured creditors for £2,728, who held as security a charge on the freehold factory of the company. The assets were returned at £52,326, from which had to be deducted £641 for preference claims, and £15,731 owing on debentures. The net assets were thus reduced to £35,954, and as regarded the unsecured creditors a surplus was shown of £5,860. The assets were as follows:—Stock-in-trade and work on hand at estimated cost £23,000, machinery and tools as per books £8,967, trade fixtures and fittings as per books £3,403, patents and patterns as per books £2,975, freehold factory £8,699, less mortgage of £2,728—£5,970, shares in public company £145, book debts (good) £7,740, doubtful and bad debts £464, expected to produce £100, and cash in hand £24.

Mr. Hardy reported that the company was formed in 1906. At the outset it was purely an automobile business, but subsequently an electrical side was started. He was appointed to act as the Receiver of the company on April 11th last. Eleven days later the shareholders passed the resolution in favour of voluntary liquidation, and with a view to saving expense, they also appointed him to act as the liquidator of the company. Since his appointment as Receiver, he had been carrying on the business, and there was plenty of work in hand. Some good work was being done at the factory, and there were numerous orders coming to hand. He was quite satisfied that he was carrying on the business at a profit, and was doing his utmost to safeguard the interests of all concerned. He did not consider it right that a Receiver should merely study the interests of the debenture-holders, and he was, therefore, also looking after the interests of the unsecured creditors. Mr. Waller asked if any of the debentures had been issued recently, and Mr. Hardy replied that the debentures were all issued more than two years ago. No debentures had been issued since 1911, and the consideration for their issue was cash advanced. Mr. Lea inquired if the directors of the company were also the debenture-holders, and he was told that three directors of the concern held the majority of the debentures. Mr. Lea stated that on the file of the company at Somerset House was a copy of a balance-sheet for 1911, which contained a very peculiar note by the auditors. The note stated that property had been purchased for £27,000 and shares issued, but there had been some irregularity in the issue of the shares, and for the purposes of the balance-sheet, neither the property nor the shares were brought into account.

Mr. Hardy replied that he knew nothing about the matter, and the solicitor also said he could not give any explanation.

Mr. G. G. Poppleton said that the stock-in-trade and work in hand formed a very considerable portion of the assets. He asked what was the value of the stock, and how the value of the work in hand was arrived at. Mr. Hardy said he understood that the work in hand was valued at about £3,000, while the stock was worth about £20,000. In answer to Mr. Figgins, who asked what the assets were likely to realise at a forced sale, the chairman said that the stock and other assets had not been taken at inflated prices. At a forced realisation he understood that the whole of the assets would realise from £25,000 to £30,000. The claim of the bank amounted to £11,912, and they held no direct security from the company, but were guaranteed by the directors. He understood that the bank were fully secured for the whole of their claim. Asked what the stock consisted of, he replied that it was a very varied stock, and was in good condition. Some £13,000 represented electrical stock.

Replying to further questions, the chairman said that the directors had never received any fees. The managing director was entitled to a salary of £1,200 a year, but in respect of the last 12 months there was about £500 due to him. The directors were really creditors of the company.

Mr. Poppleton expressed the opinion that the unsecured trade creditors could not expect to receive payment in full. Capital to the extent of some £54,000 had been issued and there was now a

surplus, so far as the creditors were concerned, of only £5,000. In other words, nearly £50,000 had to be accounted for since the formation of the company in 1906. He asked what had been the results of the trading. Continuing, he said he would also like an explanation of a circular which had been issued, which stated that the liquidation and receivership did not disturb the business, and that it would go on just the same under the same management. Did that mean that the trade creditors were to be paid in full?

The chairman replied that he had not had sufficient time to prepare the figures asked for, and at the present moment he was unable to give details as to the past history of the concern. The opinion was expressed by Mr. Poppleton that the liquidator ought to be in a position to tell the creditors what happened when the company was formed, and what its transactions had been since. He asked what assets were taken over by the company, and the chairman replied that he could not give the particulars.

A creditor expressed the opinion that unless there was a very careful realisation, those interested would come off badly. Mr. Hardy represented the debenture-holders, and it was advisable that the creditors should nominate someone to act as joint liquidator, who would represent their interests. The creditor suggested that the Rotax Motor Accessories Co. should be nominated to make the necessary application to the Court for the appointment of a joint liquidator to act with Mr. Hardy.

After a short discussion the resolution suggested was carried by a large majority, and the solicitor for the company then stated that there was every chance of the business being realised to advantage. Application might shortly be made to the Court with reference to the disposal of the business. He had advised the liquidator not to answer certain questions, as there might be some persons present who desired to bid for the business. A Committee of the principal creditors was also elected.

ADAMSON, RAMSBOTTOM & CO., LTD.—A meeting of creditors was called for May 15th at 6, Castle Street, Liverpool; Liquidator, Mr. B. Cookson.

PATENT BRAKE BLOCKS, LTD.—A meeting is called for June 10th at 8, Old Bank Buildings, Chester, to hear an account of the winding up from the liquidator, Mr. W. Conway.

WESTERN ELECTRIC CO. (AUSTRALIA), LTD.—A meeting is called for Norfolk House, W.C., on June 13th, to hear an account of the winding up from the liquidator.

OUDTSHOORN ELECTRIC LIGHT AND POWER CO., LTD.—A meeting is called for June 12th at 71A, Queen Victoria Street, E.C., to hear an account of the winding up from the liquidator, Mr. E. West.

ROSSENDALE BELTING CO., LTD.—First meetings of creditors and contributories are called for May 23rd at the Official Receiver's Offices, Byron Street, Manchester.

Trade Announcement. — MR. R. B. BEATTIE, of Burnley, has opened a branch shop at 5, Orchard Road, St. Anne's-on-the-Sea, and he desires to receive lists from makers of heating and cooking apparatus and electric light fittings.

France.—La Société Dynamo Phare Eyquem is the name of a new company which has just been formed at Levallois-Perret (85 and 87, Rue Chaptal), with a capital of £18,000, to manufacture the car electric lighting dynamo of that name.

"Delcoblast."—The DAVIS ELECTRICAL CO., of 17, Moor Street, Charing Cross, London, W., are supplying the "Delcoblast" frosting process for lamps, for which they make a number of claims.

Catalogues and Lists.—THE ELECTRICAL CO., LTD., 122-124, Charing Cross Road, London, W.C.—Priced leaflet relating to "Goliath" holders for H.C.P. metal lamps, also a priced card relating to their frosted radiator lamps. Both of these lines are carried in stock.

MR. O. N. BECK, 11, Queen Victoria Street, London, E.C.—Illustrated list describing the "Triplex" valve, line drawings being given to show several schemes of connections for these valves.

MESSRS. TURNERS & MANVILLE, LTD., Houptoun House, Lloyd's Avenue, London, E.C.—Twelve-page pamphlet dealing with their "J.-M." dry batteries, "T. & M." adhesive tapes, and "T. & M." fireproof and "Niagrite" tapes. Prices are given.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.—Four new catalogues have just been issued in uniform style containing fully-illustrated matter with tabulated prices, and connection and other diagrams. The ground covered may be understood generally from the following:—No. 113 (28 pp.) is devoted to Murday recorders, and contains interesting particulars of new types; No. 117 (36 pp.) deals with portable electrical instruments, and gives particulars of the firm's ammeters, voltmeters and wattmeters; No. 118 (24 pp.) is devoted to Foster practical pyrometers, a new type of instrument, suited particularly for engineers; and No. 120 (32 pp.) is the new edition of the firm's catalogue of "Megger" testing sets.

MR. CHAS. E. MILLER, Reade Street, New York, U.S.A.—Catalogue No. 25, giving illustrations and prices of a host of apparatus and supplies for motor-cars, motor-boats and cycles.

MESSRS. BRUCE PEEBLES & CO., LTD., Edinburgh.—Specification sheet No. 59 details and shows the Peebles standard turbo-alternators. The enclosed type, which is the standard arrangement of all their turbo-alternators, excepting the two smallest sizes, is shown. A separate specification sheet details the exciters.

MESSRS. PHILLIPS & TURNER, 71, Broad Street, Birmingham.—12-page preliminary list of general electrical accessories—bell material, lampholders, distribution boards, switches, hand lamps, &c.

THE CAR AND GENERAL INSURANCE CORPORATION, LTD., 1, Queen Victoria Street, London, E.C.—Illustrated (colour) booklet, giving some interesting old pictures showing very early motor-vehicles running on public thoroughfares. Copies will be sent to any interested reader.

BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—List No. 2,440, fully describing and illustrating, and showing prices of, their four different forms of current transformers.

MESSRS. PASS & SEYMOUR, INC., Solvay, New York, U.S.A.—Two bulletins effectively dealing with their "Shurlock" device for preventing stealing of electric lamps, also their electric advertising signs.

MESSRS. ISAAC STOREY & SONS, LTD., Empress Foundry, Cornbrook, Manchester.—Twenty-page fully illustrated catalogue dealing in detail with Scott's patent air compressors.

MESSRS. WHITTAKER & CO., 2, White Hart Street, E.C.—Catalogue of scientific and technical books, 1913.

Ghent Exhibition.—MESSRS. GENT & CO., LTD., Faraday Works, Leicester, are exhibiting at Ghent a full range of apparatus as supplied by them to the British G.P.O., comprising secret and C.B. interphones, the "Borough" and "Nugent" water level indicators and recorders, water level alarm contacts, &c.

Bankruptcy Proceedings.—T. A. FLATHER, electrical engineer, lately at Park Electrical Works, Leeds.—Application for debtor's discharge to be heard on June 9th, at the County Court House, Leeds.

BERNARD MUSGRAVE, director of a limited company, Howick, near Preston, lately Astley Bridge, near Bolton.—Application for debtor's discharge to be heard at Bolton on June 11th.

FRED. SHAW, electrical contractor, Hull.—May 29th is the last day for receipt of proofs for dividend. Trustee: Mr. G. H. Acheson, York City Bank Chambers, Lowgate, Hull.

E. J. CROSIER (Crosier, Stephens & Co.), engineer and merchant, Newcastle.—A third dividend of 6d. in the £ is payable May 26th. Trustee: Mr. J. A. Gardner, 145, Pilgrim Street, Newcastle-on-Tyne.

Exhibitions.—The *Times* states that movements are on foot for holding a Universal Oil Exhibition, at Earl's Court, in March, 1914, and an International Exhibition in Manchester, from May to October, 1914.

E.M.B. Resistances. — We are informed that the ELECTRO-MECHANICAL BRAKE CO., LTD., are doing a large business in their "E.M.B." unbreakable, jointless and rustless grid type resistances. Orders have recently been received for the Corporations of Leeds, Manchester, Oldham, Newcastle, Leicester, Birmingham, Blackpool, L.C.C., West Ham, &c., and a number of well-known firms and railways, making 2,500 resistances of this type in use or on order.

Book Notices.—The Anglo and South American Publishing Co., Ltd., of London, is about to publish an "Encyclopedia of South America" in four large quarto volumes, copiously provided with coloured maps and other illustrations, under the general editorship of Mr. W. H. Koebel. This will be followed a few weeks later by a "South-American Year Book."

"Cab Signalling," summary of a lecture delivered to the London Section of the Permanent Way Institution on February 15th, 1913 by W. H. Dammond. From the Author.

Engineering Directory of Advertisers. No. 56. April, 1913. London: "Engineering," Ltd.

Electric Clocks.—We have received the following communication from the SILENT ELECTRIC CLOCK CO., LTD., of Goswell Road, E.C., in reply to the letter published on page 756 of our last issue:—"In your current issue we observe a communication from the Magneta Time Co., in which exception is taken to a paragraph in your issue of April 25th, mentioning that electric clocks manufactured by the Silent Electric Clock Co. are being exhibited at Ghent Exhibition 'of the standard pattern as supplied to H.M. Post Office.' While we have no desire to in any way belittle the admirable work achieved by the Magneta Time Co., we think that they overlook the fact—when giving their list of installations in postal buildings—that their system was supplied to the Office of Works, who formerly supplied fittings and furniture, including clocks, to *all* Government buildings. The Magneta Co. are, therefore, contractors to the Office of Works. Now we have supplied electric clocks to the Post Office direct. No doubt the Post Office exhibit at the Ghent Exhibition is confined to those firms who are contractors to that Department, and does not include exhibits from contractors to other Departments. We apologise for troubling you in so small a matter, but we feel that we must protest against any (even indirect) suggestion that we had tried to appropriate another firm's prestige."

LIGHTING and POWER NOTES.

Algeria.—An electric power plant is being installed in connection with the iron ore mines at Rouina, belonging to the Société des Mines de Fer de Rouina; it will comprise two Diesel engines and alternators, of a total of 280 H.P., one set being held in reserve. The station will mainly supply current for the Mermet workings, where an electric crane, capable of lifting 50 tons of ore per hour, from a depth of 164 ft., two large Sulzer pumps, and an air compressor, are being installed.

Bangor.—The City Council's electricity undertaking shows a loss of £624 on the last year's working; it was suggested that the price per unit be increased by 1d.

Basingstoke.—The T.C. on May 8th instructed the surveyor to prepare plans for an E.L. station to be erected in Rectory Meadow.

Birmingham.—The City Council has approved of the report of the Electric Supply Committee, authorising it to proceed with the new power house at Nechells, the equipment of sub-stations, the provision of underground mains, &c., (referred to at length in our last issue), and instructing the Finance Committee to borrow £500,000 in respect thereof.

Brighouse.—In his annual report, Mr. A. Aspinall, engineer and manager of the electricity department, states that the revenue account shows an increase as compared with the previous year, of £613.

Broadwater.—The Worthing T.C. is making a canvass in order to ascertain what demand there is at Broadwater for electricity, with a view to the cables being extended to that parish.

Burton-on-Trent.—The Gas and Electricity Committee has decided to invite members of the Council to visit the gas and electricity works on May 30th, on which occasion the new electrical plant will be brought into use.

Bury St. Edmunds.—The B. of G. has referred to a Committee the question of having the old and new workhouse premises lit by electricity.

Canterbury.—The T.C. has decided to install at the electricity works a Harris-Anderson water-softening plant with a capacity of 3,000 gallons, at an estimated cost of £300.

Continental Notes.—FRANCE.—Great progress is being made with the establishment of the new central electricity station of the Societé Nantaise d'Eclairage et de Force par l'Electricité at Nantes. The plant, which has a capacity of 17,000 KW, is expected to be completed during the coming summer.

ITALY.—La Societa Ligure-Toscana d'Elettricita, of Leghorn, is putting down a new 3,000-H.P. steam turbine and alternator at its central station in Leghorn; a new hydro-electric station of 10,000 H.P. capacity is also being established on the River Serchio. A 30 000-volt transmission line is also being established between Pescia and Prato to connect the company's system with that of the Societa Minera et Elettrica della Valdarno, with which concern a contract for the supply of any surplus energy available at nights and on *fête* days has been entered into.

Dudley.—At the T.C. meeting last week, Councillor Ballard directed attention to a statement which had been made that negotiations in respect of the sale of the electrical undertaking were being delayed owing to some difficulty which had arisen. He asked if that was correct, and how long it would be before the negotiations would be completed? Councillor Hughes said it was perfectly obvious that the negotiations were delayed, or they would have been completed. As to when they would be concluded nobody knew, but the matter was a purely legal one.

Dundee.—The Corporation electricity department has just finished a most successful year, having generated considerably over 10,000,000 units, which is a big increase over the previous year's output.

Easington.—At a special parish meeting last week, it was agreed to adopt the Lighting Act, and to carry out a scheme for public and private lighting, the idea being that the Easington Coal Co. will supply the necessary energy.

Emley (near Wakefield).—The U.D.C. has decided that the Yorkshire Electric Power Co. be asked to reopen negotiations for the lighting up of the village.

Fife.—The whole of the running staff of the generating and sub-stations of the Fife Electric Power Co. recently resigned their positions, owing to a number of grievances culminating in a demand that the shift engineers should work 12-hour shifts (84 hours per week) at bare "time" rate during the annual holiday period, there being no spare men. The case being put before a director of the company, he denied all knowledge of any dissatisfaction amongst the men, and promised to bring the whole matter before the rest of the directors at their meeting next week. He persuaded the men to provisionally withdraw their resignations, and promised that no action would be taken by the management or directors in the meantime.

Heckmondwike.—The annual report of the Council's electricity undertaking shows an increase during the year in units sold of 163,872, or 12 per cent. Notwithstanding the high price of coal during the strike, the fuel cost per unit was only ·31d., as compared with ·36d. in the previous year. The cost of energy purchased from the Yorkshire Power Co. was ·75d., as against ·62d. per unit from the Council's own plant. The total income increased by £931, and the sum taken to profit and loss account increased from £850 to £1,873, and the balance on this account to meet capital charges was £10,258, whilst the sinking fund balance stands at £8,161.

Hereford.—The T.C. has received from the L.G.B. sanction to loans of £500 for mains, £600 for pumping machinery, and £950 for cables, the two latter being in connection with the electrical pumping at the water-works.

Hertford.—The North Metropolitan Electrical Power Supply Co. has applied to the R.D.C. for consent to the supply of energy within the district under the company's 1907 Act; the Council has deferred its decision for a month.

Heysham.—The U.D.C. has given consent to Morecambe T.C. supplying current to premises in the town under an order to be obtained from the B. of T. The Council has also asked Morecambe Corporation at what price per unit it will supply electricity for lighting Sandilands Promenade.

Honiton.—The T.C. has accepted the tender of the Electric Supply Co. for a portion of the public lighting at £7 15s. per 150-C.P. lamp per annum.

Hull.—The E.L. Committee is again submitting to the Council its proposal regarding the supply of electricity to Hessle, which was defeated at the last Council meeting.

Ilkley.—The District Council is considering a scheme for including in the town some portion of Middleton, a township across the river, and for obtaining powers for an extended electric lighting scheme for Ilkley and district, including Middleton, as Ilkley already possesses powers to supply the latter with gas and water. At a meeting last week the District Council approved a report of Mr. Geo. Wilkinson, the electrical engineer to the Harrogate Corporation, on a scheme of electric lighting to cost £18,000.

Leeds.—At a meeting of the City Council last week, reference was made to a resolution of the Tramways and Electric Committee promising to defer further consideration of the question of instituting a scheme of motor hiring, in order to give time for a trial of the scheme submitted by Mr. H. S. Ingleby. Mr. D. B. Foster, in moving the rejection of this resolution, maintained that it was an attempt to prevent the development of direct trading by the Corporation. The amendment was seconded by Mr. G. H. Pearson. Alderman H. Brown, in opposing the amendment, said that whilst they were all desirous of extending the use of electricity in the city, the Corporation meant to see that whilst the tradesmen should have motors, those tradesmen engaged in the manufacture of the electric motors could supply them. Alderman Penrose-Green also opposed the amendment, and said they had no right to take away the trade of hard-working electricians. Alderman Hepton said that whilst he was in favour of municipal enterprises in monopolies, he did not think it would be wise at present to adopt the system of hiring out motors. Electrical apparatus was being constantly improved, and they might find themselves with a mass of old stock on hand. The amendment was defeated, and the minutes approved.

Leyburn.—The U.D.C. on May 9th decided to consent to overhead lines being used at Leyburn for electricity supply by the local gas company.

Llanfairfechan.—At a meeting of the U.D.C. last week, the question of the feasibility of lighting Llanfairfechan with electricity was re-opened, and a committee was appointed to go into the matter.

London.—The Westminster City Council's contracts with the Charing Cross and Metropolitan Electric Supply Cos., and the St. James' and Pall Mall Co, for the supply of energy to the Council's buildings, are to be continued for a further period of 12 months from June 24th next.

POPLAR.—At the meeting of the B.C. last week, the Electricity Committee reported having had under consideration a proposal of the electrical engineer that an oil fuel apparatus should be provided for use at the generating station. This apparatus, the Committee stated, had been specially designed to meet the demands of power stations, for use over peak loads, and to meet any sudden demands caused through increased load, or in case of breakdown due to fan motors failing. If fitted to the new Babcock boiler with underfeed stokers, the normal evaporation rate of 36,000 lb., approximately, could be increased to 53,000 lb., without the abnormal increase in coal consumption necessitated by forcing the boiler. The Committee recommended that this apparatus with the necessary tank, pump and pipe connections be provided at an estimated cost of £133. This was agreed to.

HAMMERSMITH.—The mains are to be extended to Messrs. Waring's factory, which it is expected will be electrically driven, and require some 200 KW. The Electricity Committee has had under consideration the question of enforcing penalties for delay by Messrs. Richardsons, Westgarth & Co. in completing their turbine contract of 1911. The Committee felt that in view of the satisfactory work carried out by the contractors, the Council might reasonably forgo the imposition of penalties.

Manchester.—The scheme for the improved lighting of the streets has now been confirmed by the City Council; the streets in which electric lighting will be installed are as follows: Peter Street, Oxford Street (excluding St. Peter's Square), Oxford Road, Wilmslow Road to Fallowfield, Deansgate from Quay Street, Great Ducie Street to Waterloo Road, Cross Street, Corporation Street, Cheetham Hill Road to Queen's Road, Oldham Street, High Street, Shudehill, Withy Grove, Market Street, St. Mary's Gate, Stretford Road. The total length of the streets allocated to electric lighting is 13,621 yards, and to high-pressure gas lighting is 13,500 yards. Plans are now in course of preparation with a view to an early commencement of the constructional work, which will be spread over a period of three years.

The Corporation Gas Committee has instructed the chairman and engineer to visit certain Continental towns for the purpose of

inspecting certain installations, and also "to make an inspection of large gas engine plants in view of the likelihood of an extensive use of gas for the generation of electricity."

Middleton.—The working of the electricity undertaking of the Corporation for the past year has resulted in a loss of about £1,800.

Morley.—The electricity undertaking made a gross profit of £1,528 during the past year, and after meeting financial charges there was a deficit for the year of £416, as compared with last year's deficit of £783.

An exhibition of cookery by electricity is to be held during the week commencing June 2nd, by Messrs. Gillespie and Beales, the T.C. supplying current for the period.

Oldham.—Arrangements have been made between the Electricity Committee and the Royton U.D.C. in regard to a supply of electricity to Royton. Should the U.D.C. obtain at its own expense a prov. order for the supply of electricity within its district, the Committee would be prepared to take a transfer of such order upon terms and conditions to be arranged and give a supply upon the same terms and conditions as electricity is supplied in the borough of Oldham.

The Electricity Committee reports a profit of £1,043 on the past year's working against £664 last year.

At a meeting of the Electricity Committee last week, it was reported by Mr. Newington (Electrical Engineer) that during the past year there had been an increase in the units sold of about 10 per cent. for lighting and 47 per cent. for power. There were 6,463,416 units sold, against 5,992,476 in the previous year.

Oulton Broad.—The U.D.C. has asked the Electricity Co. on what terms it would be prepared to undertake street lighting for a year from September 29th next.

Penmaenmawr.—The U.D.C. has decided to write asking the North Wales Electric Power Co. whether it is willing to provide a supply of electricity for public purposes in the district.

Pontefract.—The Yorkshire (West Riding) Electric Tramways Co., Ltd., has applied to the B. of T. for permission to erect overhead lines at Pontefract for the transmission of energy at a pressure of 10,000 volts for the purpose of supply under the Electric Light Orders of 1907 and 1912.

Preston (near Stockton-on-Tees).—The P.C. is negotiating with the Cleveland and Durham Electric Power Co. for the lighting of the parish by electricity. The company has made a survey of the district, and if sufficient private consumers are secured, the scheme will be carried out.

Redditch.—The question of the financial position of the electricity undertaking came up for discussion at the Council meeting last week, when it was decided to appoint a new works manager at £300 per annum.

Rotherham.—The electrical engineer (Mr. E. Cross) in his report upon the undertaking for the 12 months ended March 31st last, draws attention to the remarkable reduction in the cost of operation, as against any figure that had hitherto obtained, particularly when the high cost of fuel and the increased cost of materials generally are taken into consideration. The cost of generation, ·541d. per unit, he considers as distinctly good when compared with the results obtained by towns of a similar character to Rotherham. The reduction in costs is due to the increasing power load, and the adoption of turbine machinery instead of continuing with reciprocating plant. The increase in the units sold was as follows:—Tramway department—(*a*) 1912, 1,414,449; (*b*) 1913, 1,568,247; (*c*) per cent. increase, 10·87. Power—(*a*) 1,118,912; (*b*) 1,596,142; (*c*) 42·65. Lighting—(*a*) 370,292; (*b*) 451,198; (*c*) 21·85. The total receipts obtained amounted to £21,823, as against £18,860 in 1911-12, but the average price per unit sold had decreased from 1·558d. to 1·448d. Notwithstanding the latter, the net profit carried to appropriation account increased from £3,376 last year, to £5,179, which represents a percentage of 6·47 per cent. on the total capital expenditure to date of £79,921. The accumulated renewals fund at March, 1912, stood at £12,737, representing 18 per cent. on the capital expenditure for that year.

Rhondda.—A L.G.B. inquiry was held on the 7th inst. into the application of the Council to borrow £23,400 for the electrical undertaking and £38,500 for a refuse destructor. The proposed expenditure was opposed by the local colliery and railway interests. An agreement has been entered into by which the energy produced by the destructor plant between 6 a.m. and 3 p.m. will be sold to the local power company, who will resell electricity to meet the Council's requirements between 3 p.m. and 6 a.m.

Salford.—One of the members of the T.C. has given notice of a resolution asking for the appointment of a committee to make inquiries as to the general lighting of the borough.

St. Helens.—The T.C. has applied to the B. of T. for an order to supply current to Messrs. W. Neile & Sons' ironworks at St. Helens Junction, which is outside the borough, and for permission to give the supply by overhead lines.

St. Margarets.—The Dover T.C. has decided not to proceed at present with the proposed extension of overhead mains to St. Margarets, a village some five miles from the town. The estimated cost of the extension is £1,500.

Sheffield.—The Extensions, Works and Stations (Electricity) Sub-Committee of the Corporation has just issued a report upon the method which should be adopted to carry out the powers given the Corporation under its Act of 1912. So far as the sale of electrical fittings through a contractor carrying on his business independently of the Corporation is concerned, the report states that a conference was held between local electrical contractors and the Sub-Committee when, after a deal of discussion, the deputation expressed the opinion that a scheme based upon the lines of the Bristol scheme might be acceptable to the contractors. Accordingly, a scheme on these lines was prepared and submitted for consideration to a meeting of the contractors who, in a letter to the town clerk, stated that from evidence taken, the Bristol traders were unanimous in their condemnation of the scheme which was only in operation by the goodwill of the Corporation, and the opinion was expressed in the letter that it was not possible to frame a scheme which would not contravene the judgment the local traders had obtained by the Chancery action of February last, and the subsequent provisions agreed in the 1912 Bill, and upon which action and Bill they had been compelled to expend so much time and expense. Continuing, the letter stated that in the opinion of the traders, the only practical and impartial interpretation of the Act is (1) If the Corporation desires, it has the right to keep a showroom for exhibits only, but not in any way to use it for trading, either directly or indirectly; and (2) a printed list of all contractors should be kept or delivered occasionally with bills for current, or in any other method it thinks desirable to extend the business, and in which it will have the full co-operation of all electrical contractors. In conclusion, it was stated that the contractors having given ample time for the consideration of the above matters are not now agreeable to any continuation of Corporation trading by the electrical supply department in any form other than allowed by the 1903 and 1912 Bills, and the judgment obtained. Having considered this letter, the Sub-Committee states that it is still considering the way in which to carry on the work of the department, and will shortly submit a recommendation dealing therewith.

Stockport.—The T.C. has rejected a claim for £463 made for damage done by fire, by a local firm, on the ground that the conflagration was caused by the fusing of cables placed through the premises affected without any earthing. The Council denies liability for the fire.

Swansea.—At a meeting of the Tramways and E.L. Committee, Mr. Alex. Sinclair, the chairman, said the net profit of the undertaking for the past financial year was about £2,000, as against £3,600 for the previous year. The revenue had increased satisfactorily, but the financial results were lower by reason of the coal strike, the higher price of fuel, advances in wages, increased interest and sinking-fund charges, and reductions in prices to consumers, who had been allowed a rebate of 2½ per cent. all round. He thought the net result most satisfactory, in the circumstances. The question of lighting the new Swansea Asylum with electricity was raised, and it was suggested that, if this were done, the whole of the Sketty area might be taken into consideration. For such purpose, the consent of the outlying authorities would have to be obtained. The town clerk was asked to report on this aspect of the matter. Arising from a request from the Housing Committee, the electrical engineer, Mr. Prussmann, reported on the lighting of the 300 workmen's dwellings the Corporation proposes to erect on Town Hill. He suggested that six lights be installed in each of the smaller houses, for which a sum of 1s. 2d. should be added to the weekly rent, this amount to include installation, the supply of electrical energy, and the supply of one metallic-filament lamp per annum; the six lamps to average not more than 32 C.P. per lamp. The chairman strongly recommended the adoption of the proposal, which would be the first of its kind in Swansea, and it was agreed to.

Swinton.—The electrical engineer has submitted an estimate of the cost of electrically lighting Cromwell Road and Warwick Street, and the matter has been referred to a Sub-committee of the Council.

Torquay.—The electrical engineer has prepared a model showing the proposed scheme of illumination of the Winter Gardens. Prices are to be obtained from firms for carrying it into effect.

Tunbridge Wells.—Application is to be made to the L.G.B. for sanction to the borrowing of £3,100 for the purpose of mains, sub-station pillars, transformers and house services. Notice has been given the Tunbridge Wells Gas Co. of the Council's intention to convert a further 50 gas lamps for electric lighting in the streets in which cables are already laid.

Wakefield.—The city electrical engineer, having reported that the question of extension of plant and mains, to ensure continuity of supply next winter, should be taken into consideration, the matter is to be dealt with at a special meeting of the Electricity Committee.

Walsall.—The Electric Lighting Committee has received a protest from the Local Tradesmen's Association against the increase in the charge for electricity for lighting purposes from 4d. to 5d. per unit.

West Hartlepool.—At last week's T.C. meeting it was reported that the new generating station would be in working order by the next meeting of the Council.

Wimbledon.—The Council has offered to supply energy for power purposes, at 1½d. per unit, to the site of the L. & S. W. Rly. Co.'s new railway power house off Durnsford Road, for the use of the contractors, &c.

Worksop.—At the last meeting of the U.D.C., the clerk reported upon the financial position of the Council. With regard to electric lighting, it was explained that the total income (including £1,226 charged for street lighting) was £6,271. The expenditure on the revenue account was £3,165, and after allowing £400 for machinery, £160 for reserve stock of coal, and £2,382 for repayment of loan and interest, the net profit was £139. Surprise and regret was expressed at the small profit, and considerable discussion took place. Several members urged that in future the energy supplied for public lighting should be charged for by meter, and not at a fixed charge of £15 per annum per arc lamp, and £3 per incandescent lamp. The chairman having pointed out that there were abnormal items of expenditure during the year, the matter was referred to the Committee, together with a proposal to substitute underground cables in certain streets instead of overhead wires.

Wrexham.—The T.C. has decided to supply electricity for three months for a showroom, and to provide a youth to assist therein, to a firm who have offered to open a showroom for electrical devices and to canvass for electric wiring and fittings; the firm desired the Corporation also to pay the rent of the showroom, but the Council declined to do this.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—The Corporation's first week's experience of pay-as-you-enter cars on the Woodside route has been entirely satisfactory. Compared with the corresponding week in 1912, when ordinary cars were in service, there was an increase of over £57 in the receipts, of 11,275 in the number of passengers carried, and of 403·4 in the number of miles covered.

Aldershot and Farnborough.—The Light Railways Co. has applied to the B. of T. for an extension of time until June 4th, 1914, for commencing and completing the works under the 1909 order.

Birmingham.—The receipts from the working of the Corporation tramways during the year ended March 31st last amount to £574,248, an increase of £140,200 over the previous year. Against the total income for the 12 months (£581,566) there is an expenditure of £370,178, which works out at an average of 6·764d. per car-mile, as against 6·907d. in 1912. Of this total, £160,277 or 2·929d. per car-mile went towards traffic, and £100,725 or 1·840d. to power expenses. According to the report of the Tramways Committee, there is a net profit of £101,352, after meeting interest and sinking-fund charges and charging the expenses of promoting the Birmingham Corporation Bill, 1912, and the Halesowen Light Railway order, amounting to £5,896. From this sum the Committee proposes to place £45,000 to reserve fund, which will then amount to £220,368, and to transfer the surplus of £56,352 to the borough fund. Referring to the receipts, the Committee attributes the large increase partly to the receipts from new tramways, and partly to the fact that the receipts for a full 12 months' working on the Bristol Road, Pershore Road, and Handsworth lines have been brought into account, as against only nine months the previous year. As regards rolling stock, the Committee states that in connection with the new tramways authorised by the Birmingham Corporation Act, 1912, now in course of construction in the Hagley Road, and the tramways about to be constructed in the Warwick Road, and Stratford Road (from College Road to Hall Green), it is necessary to purchase 40 new tramcars, and in order to augment the existing tramway services it recommends that 75 new cars be purchased at a cost of £83,000, including spare electrical equipment and incidentals. The question of constructing tramways from the Selly Oak tramway terminus through Northfield to the city boundary at Longbridge has also been under the consideration of the Committee, which is actively engaged in preparing a scheme for this purpose, which it hopes will be ready for submission to Parliament next year. The Council already possesses power to provide a service of omnibuses in prolongation of any tramway route in the city, the extension of which is contemplated by the Corporation. The Committee expresses the opinion that it is desirable that in accordance with this section, a service of omnibuses should be immediately instituted, and recommends the purchase of 10 suitable 'buses for this purpose at a cost not exceeding £10,000, to include spare parts and other equipment.

Black Country.—Towards the close of last week there was grave danger of the employés on the South Staffordshire and East Worcestershire Tramways coming out on strike, in which event the whole Whitsuntide traffic would have been dislocated, but happily, wiser counsels prevailed. A short time ago a memorial on behalf of the men, claiming increased wages for all grades and better conditions of employment, was presented to the British Electric Traction Co., and subsequently representatives of the men interviewed the leading officials of the company, who promised a definite reply within 10 days. The notice of the men expired on Friday in last week, on which day a letter was received from the company intimating that their decision had been postponed until this week. This aroused considerable indignation amongst the men, who, at first, seemed determined to strike, but eventually decided to take no drastic action until the receipt of the company's decision. If, however, that should not prove conciliatory, the temper of the men is such that the tramway services in the Black Country may be peremptorily suspended.

Bolton.—At a meeting of the T.C. on May 7th, it was suggested that the amount of £13,500, which was being allocated from tramway profits in relief of rates, was excessive, and that £10,000 was ample. Ald. Miles said if he told them what the Committee could have given to the relief of rates they would be surprised. The rates had a perfect right to the money allocated. The minutes of the Tramways Committee which had relation to the allocation of £13,500 were then approved.

Bournemouth.—At the last meeting of the Council, the general manager of the Corporation Tramways (Mr. Bulfin) presented his annual report for the financial year ending March 31st, 1913. The total receipts and revenue for the year amounted to £96,720, being an increase of £4,323 on last year's result, which up to this date was a record, the receipts per car-mile being 12·33d., in place of 12·022d. in the previous year. The working expenses, exclusive of capital, amounted to £52,640, being a decrease on last year's expenses of some £2,190, and, having regard to mileage run, established a record for the system, the percentage of working expenses to receipts working out at 54·83 per cent., as against 59·83 per cent. in the previous year, and the working expenses per car-mile were reduced from 7·13d. to 6·71d. The large advance in receipts was mainly due to the alteration of the services on the side routes, the revenue being increased by some £900 at a reduced car-mileage of over 4,000; the adoption of the bonus scheme for the best takings on all routes, which made the staff more keenly alive to intending passengers, and the advantage of two Easters occurring in the one financial year. The working expenses showed a decrease under each of the separate headings with the exception of power, a slight increase here being due to the higher price of coal. The total sum spent in renewals was £2,470. The capital and loan charges for the year amounted to £34,000, making the total costs £86,640, and leaving a net balance of some £10,080 to be carried to the renewals fund. As regarded the coming financial year, the general manager pointed out that the reduction of hours to the traffic staff and the increase in wages granted to the other employés meant an extra cost of some £1,500 a year; the increased cost of coal and materials an additional £1,000; no Easter occurring in the coming year meant a loss in receipts of some £1,500, making a total extra charge to the undertaking of £4,000 It was hoped the revenue from Sunday cars, advertisements in cars, and charges on parcels might make good this extra amount, but, in order to maintain the undertaking in its present financial position, it was absolutely necessary that no further concessions of any kind should be granted.

Burnley.—The Tramways Committee has made a recommendation that the centre poles on the local tramway system be removed, and replaced by side poles, with wire suspensions, at an estimated cost of £775.

A Sub-committee of the Tramways Committee is to meet a deputation from the Rawtenstall Tramways Committee to consider the question of establishing better communication between Burnley and Rawtenstall.

Bury.—The report of the general manager of the tramways states, in addition to the information given last week, that in order to provide the extra number of cars required at the week ends, and, if possible, to avoid the use during inclement weather of cars which are not fitted with top-deck covers, it has been decided to purchase four additional 56-passenger double-deck single-truck cars, fitted with top covers, similar to those already in use, with the exception that the staircase and platform have been re-designed, so as to allow the ends to be covered in for the better protection of the motormen, in case the Corporation eventually decides that this is to be done.

Continental Notes.—FRANCE.—The light railway system in the Valenciennes district belonging to the Société Economique du Nord is about to be electrified, and at the same time greatly extended; at the present time the line is mainly a single one, which is the cause of much delayed traffic. Under the new scheme a double line is to be constructed and all level crossings suppressed. The necessary electrical energy for the line will be supplied from a new power station which is being established near Valenciennes by the Société d'Electricité de Valenciennes-Anzin.

GERMANY.—A new company has just been formed in Berlin with a capital of £5,000 and the title Die Automobil Droschken-Gesellschaft "Elektric" to start a new service of electric taxicabs in the German capital.

RUSSIA.—The horse tramways in the town of Tasikent have now all been converted to electric traction, the last horse having just been taken off the service. There are at present 9¼ miles of line in operation, and 10 miles more have yet to be built. The company has applied to the municipal authorities for a concession for the supply of electrical energy for public and private lighting and power purposes in the town.

SPAIN.—La Société des Tramways de Barcelona has entered into a contract with the Compagnie Barcelonèse d'Electricité for the supply of all the energy for its different tramway lines in Barcelona as from January 1st, 1914. The necessary electrical energy will be supplied from the large hydro-electric power stations which the last-named company is establishing in the Upper Pyrenees.

SWITZERLAND.—Plans have been prepared in respect of a proposed narrow-gauge electric railway between Arzier and St. Cergue, and to La Cure and Morez. The line would be about 25 miles long, about 8 miles of which would be in French territory.

NORWAY.—Work is well in hand on the conversion of the railway between Christiania and Drammen, a distance of about 33 miles, from 3 ft. 6 in. to the standard gauge, and also to electric traction. As far as Sandviken, 8¼ miles, a double line will be laid. The question whether the necessary energy shall be taken from privately-owned companies, or whether the Government will establish its own power station, has not yet been decided. As regards the rolling stock, 17 electric locomotives of from 320 to 800 H.P., and 11 combined locomotives and carriages of 300 H.P., have been ordered. The latter are intended for use with a trailer on the Christiania-Asker section of the line, which has a length of about 14 miles.

SWEDEN.—Good progress is being made with the electrification of the railway between Kiruna and the Norwegian frontier. The construction of the transformer stations is now proceeding, and it is expected that the line will be ready for operation before the close of the present year.

Doncaster.—The Electricity and Tramways Committee has considered the doubling of the tramway track in the Market Place, and also, as an alternative, the laying of a new track along Silver Street, in order to link up the lines in Sunny Bar and High Street, but after a resolution and an amendment, both of which were lost, it was eventually decided to recommend nothing being done in regard to either proposal before the July meeting of the T.C.

Dunfermline.—What was described as an indignation meeting was held last week to consider the failure of the Dunfermline and District Tramway Co. to extend its tramway system to the western boundary of the burgh. A resolution was adopted urging the T.C. to offer strenuous opposition to any application for additional powers within the burgh which the company may make.

Edinburgh.—The Colinton Tramways Co. has unanimously approved of the terms of a draft prov. order for an extension to Fountainbridge, Edinburgh.

Greetland (near Halifax).—The U.D.C. has resolved that the scheme for the running of the tramways from Elland to West Vale *via* Long Wall be further considered in committee.

Heywood.—For the year ending March 31st, 1913, there is a loss on the tramway undertaking of £809. The profit and loss account shows a debit balance of £2,036. The Finance Committee has been recommended to apply a sum equivalent to a rate of 2d. in the £ towards the tramway deficiency, and the balance, amounting to £1,058, is to be carried forward to next year's working account.

Huddersfield.—The suggested extension of the Huddersfield tramways from Birchencliffe to West Vale, Elland, is likely to come to a successful fruition, as it is now thought that all financial and other difficulties with the Elland Council have been got over; in fact, some of the members of the Elland Council are to go to London to give evidence in favour of the Huddersfield Corporation's Parliamentary Bill.

L. & Y. Railway Electrification.—Last week the heads of several of the departments of the Lancashire and Yorkshire Railway visited Bury to inspect the newly-erected equipment for the electrification of the line from Bury to Holcombe Brook. It is understood that the electrically-driven trains are expected to be in use in two months' time.

Leeds.—A resolution was submitted at the last City Council meeting to put into operation ½d. fares on all the Corporation tramway routes. Half-penny fares are in use on some routes, and as the question of fares is to be reconsidered, the matter was not pressed.

London Tramways Assessment.—With reference to the circular notice issued by the L.C.C., asking the various Borough Councils to reduce the assessment on the County Council's tramways in their respective boroughs on the ground "that the hereditament had been reduced in value in consequence of the falling-off of the receipts from the tramway undertaking due (among other things) to competition from motor-omnibuses," Camberwell B.C. has decided to insert the assessment of the lines in the borough in the June Provisional Valuation List, at a nominal reduction of £1 rateable value.

Manchester.—Consideration has recently been given to the question of the price to be charged for electrical energy supplied for tramway purposes, and a scale has been approved by the Electricity Committee and Tramways Committee respectively. Under this scale the charge to be made by the Electricity Committee to the Tramways Committee for energy supplied for traction purposes, and also for lighting and power purposes at the car-sheds and car works, will be at the rate of 1d. per unit, based upon the price of coal at 11s. per ton; the charge for energy will, however, be increased or decreased at the rate of ·02d. per unit in respect of each 1s. per ton increase or decrease. The charge mentioned will apply so long as the consumption for traction does not exceed 30,000,000 units per annum. If and when that is exceeded the supplies for all purposes, over and above 30,000,000 units, will be charged for at the prevailing rate which the electricity department charges to large industrial power users under similar conditions of supply. The arrangement is to be in force for a minimum period of three years, but either Committee has the option of determining the agreement in the event of the City Council altering the basis upon which the contributions from the profits of the undertakings to the relief of the rates are made, thereby increasing the amount of such contributions.

The Corporation Tramways Committee has instructed the general manager to submit a report upon the suggestions recently made by a deputation which urged the adoption of halfpenny fares and an all-night service of cars.

At the City Council on Wednesday last week, Councillor Clyne asked if the agreement of Mr. J. M'Elroy, the tramway manager, did not preclude his devoting any time to tramway work for other undertakings. He had acted as arbitrator in a tramway matter concerning Bradford and Leeds, and for eight days' services he was said to have received £165. Dr. Chapman said the Committee gave its permission as it was necessary that the arbitrator should be a gentleman connected with a municipal undertaking. The payments were high, but the bulk went to the special lawyer engaged to draw up the agreements. Councillor Clyne expressed himself satisfied with the answers given.

Nelson.—The B. of T. has sanctioned the running of a goods wagon on the tramways between Nelson and Padiham, and Burnley and Harle Syke, for a further period of six months.

Newport.—So far the rearrangement and increase of the tramway fares at Newport have benefited rather than hurt the concern. The first week of the changed fares showed that there was a total of 162,218 passengers and of £704 in takings, as compared with 156,852 passengers and £631 in takings in the corresponding week of last year.

Rochdale.—A threatened strike of tramway employés has been averted. The trouble arose in consequence of the suspension of a motorman, who declined to turn out for a fresh spell of duty when requested to do so by an inspector. The Tramways Committee heard his explanation last week, and subsequently it was announced that the Committee, whilst regretting the man's act of insubordination, and also that he did not seek an interview with the manager, had decided to annul the effects of the week's suspension, and pay him the week's wages which he missed. The men expressed satisfaction with the decision.

Rotherham.—The manager reports an increase of £6,858 in the total receipts of the tramways department, as against the previous year, the actual figures being £42,714, as against £35,856, an increase of 19·1 per cent. This increase, he states, is largely due to the extension of the Broom Road and Dalton sections, and to the additional feeding value to the former of the Maltby trolley 'bus system. The receipts per car-mile are on a paying basis on each section except the Broom section, and there is no doubt that on a full year's working, the receipts per car-mile on this section will prove to be a satisfactory figure. The number of car-miles run were 772,610, as against 720,132, and the number of passengers carried increased from 7,813,922 to 8,774,539. The cost of repairs to permanent way during the year amounted to £1,262, and to cars £3,332. The gross profit of £13,966 compared with £10,642 obtained in the previous year, and represented 4·34d. per car-mile, as compared with 3·28d. for the previous year. After deducting the usual allowance for redemption of debt and contribution to sinking fund and interest, the net profit was £5,787, as against £3,723 in 1911-12.

South Shields.—At a meeting of the T.C. on the 7th inst., Alderman Wylie, in moving the adoption of the Tramway Committee's report, stated that the new system of penny fares had proved a great success, and, in the opinion of the manager, had met the convenience of the public better even than had been expected. Now the traffic was divided between two routes, instead of being largely restricted to one, and there had been a great levelling-up of the traffic. The increase of receipts had been very satisfactory, and the increases of the number of passengers carried had been as follows:—Ordinary adult fares, 14·3 per cent.; children's fares, 15 per cent.; penny workmen's fares, 55 per cent.; and in 2d. workmen's fares, as against 3d. fares, 240 per cent.

Swansea.—The T.C. has decided to apply to the Light Railways Commissioners for an order to construct three lines of railways in the borough, which will join the existing tramways at various points.

U.S.A.—After numerous tests of an experimental locomotive which will develop 5,000 H.P. for short periods, the New York Central Railway has placed an order for nine similar locomotives with the General Electric Co. The new engines will weigh 100 tons, or 15 tons less than those now in use; this weight is carried on four two-axle bogie-trucks, and every axle will carry a motor, no gearing being employed. The motors are electrically connected permanently in parallel in pairs, and the pairs can be connected in series, series-parallel and parallel. In order to obtain flexibility, the locomotive is built up of two 22-ft. trucks, hinged together at the centre, and each mounted on two two-axle bogies. The cab, which is 33 ft. long, is mounted on the centre pins carried on these trucks. The locomotives are designed to haul a 1,000-ton train at 60 miles per hour continuously, developing 1,400 H.P., but, as previously stated, they can develop 5,000 H.P. for a short period.

Wakefield.—The City Council has decided to oppose the Morley Corporation Bill, unless the promotors give an assurance to amend the Bill so as not to be able to construct a railless trolley system on any part of the route over which the Yorkshire (West Riding) Electric Tramways Co. has power to construct light railways.

Warrington.—Last week it was reported that the Corporation tramways had had a record year, the profits having increased from £2,456 to £2,981. The reserve fund now amounts to £10,000, and the system has paid £6,000 towards the reduction of the rates, including £1,500 in the latest returns.

Wigan.—The profit on the past year's working has been £1,178 compared with a loss in the previous year of £4,189.

TELEGRAPH and TELEPHONE NOTES.

Imperial Wireless System.—On Wednesday last week the report of Mr. G. W. Knox and the chairman on their examination of the pass-books submitted by Sir Rufus Isaacs and Mr. Lloyd George was received by the Select Committee on the Marconi contract. No items were found relating to dealings in Marconi shares, except those already explained to the Committee.

Mr. Marconi then made a long statement, reviewing the history of wireless telegraphy from the date of his first experiments in 1895. He said that he first received signals across the Atlantic by day on December 12th, 1901, and official messages were transmitted on December 16th, 1902. A news service was commenced in March, 1903, but was discontinued on account of increasing difficulties as the spring advanced. At every stage he experienced the necessity of increasing the power of the plant employed. In 1905 he patented his horizontal directional aerial, which at once brought about a most marked improvement in the strength of signals; it was from this point that real progress in long-distance work was dated. He had used wires laid on the ground for war purposes in Tripoli, but that method was not suitable for commercial work. To achieve equal efficiency without the horizontal aerial, a mast two or three times as high as the Eiffel Tower would be necessary. In October, 1907, a service of Press messages was inaugurated between England and America, and in 1908 commercial service was commenced, and had never been discontinued except when the station at Glace Bay was destroyed by fire. In October, 1910, messages were transmitted from Clifden to an Italian ship over a distance of 3,473 miles by day, and from Clifden to Buenos Ayres at night, 5,849 miles. Communicatian was carried on between Coltano and Massaua, 2,238 miles, and between San Francisco and Honolulu, 2,078 miles, the former span including 1,599 miles over land surface, partly in the Tropics. He had been responsible for the equipment on over 1,000 ships, and four stations working over 2,000 miles, as well as 20 stations having ranges of over 1,000 miles. His present long-distance system included several patents which he considered as important as the "four sevens" patent, and these, together with his experience and that of 200 able engineers, and an expenditure of £360,000 on experimental work, constituted the right for his company to ask what he considered very reasonable terms for the long-distance stations required by the Government. His system had been developed without the assistance of the Government. He could not agree that the system used by the British Admiralty materially differed from his own system; he had inspected the installation on a British warship in September, 1911, and stated that the system there installed was the Marconi system pure and simple. He was employing a continuous-wave system at Clifden without any sparks whatever; it was wrong to say that the Marconi system was a spark system. Automatic working was not new; he had used it in his trans-Atlantic service, and was prepared to transmit and receive automatically on that service. If the Poulsen system were adopted for the Imperial stations, every installation on board British ships would have to be altered before it could receive messages from the long-distance stations. His company never sought to purchase the Poulsen patents. He totally disagreed with much of the evidence given by Mr. Taylor, of the Post Office, and statements by Sir Henry Norman. The U.S. Government had a number of Marconi stations at work and under construction, and the Marconi Co. had important agreements with the French Government. Sir H. Norman had said he believed there was no experience of working 2,000 miles largely over tropical lands; yet Sir Henry had visited the Coltano long-distance station, and had been informed there that it communicated with Massaua, which was well within the tropics. He had never speculated in the shares of his companies. No syndicate ever existed in connection with any of the shares of any of the Marconi companies. Neither he nor his company was responsible for the fluctuations of the prices in the market. Mr. Marconi protested against the reflections which had been made upon his company and himself for having innocently entered into a contract with the Government; he resented the inquiry into the affairs of his company, which had no relation to the contract, particularly the transactions in America related by Mr. Isaacs, whose evidence he endorsed, and he regretted that the services which his company and he had for so many years rendered to the nation should not have been deemed worthy of higher consideration. He objected to the use of his name as a by-word in party politics. He considered that his was the only company that was capable of fulfilling the requirements of the Imperial chain. The long delay had been very hard on his company, which had engineers waiting to do the work; the price of materials had gone up and the circumstances had changed.

The Committee adjourned for the Whitsuntide recess.

Japan.—A sum of £300,000 is allotted in this year's Japanese Budget for the provision of new telephone apparatus. It is stated that over 12,000 applications for the installation of the telephone are awaiting attention.

Long-Distance Wireless.—On May 9th the wireless station at Nauen, near Berlin, succeeded in establishing communication with the station at Sayville, Long Island, near New York City, a distance of over 4,000 miles.

Poulsen System.—It is stated that Mr. A. S. Baxendale is the chairman and managing director of the Universal Radio Syndicate, which has purchased the patents controlling the Poulsen system of wireless telegraphy; the other directors are Messrs. Rommell, Barton and Gandil. Dr. Erskine-Murray has been appointed consulting engineer to the syndicate. Messrs. Wernher, Beit & Co., Messrs. Kleinwort, the Imperial Tobacco Co., and Sir Robt. Jardine are said to be interested in the system as shareholders.

Telephone Rates.—The Postmaster-General hopes to be able to make an announcement on the subject of the revised scale of telephone rates before the end of June.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdare.—May 29th. Cables, street work, junction boxes, incandescent fittings for street lighting, meters, &c., for the Council. See "Official Notices" to-day.

Australia.—VICTORIA.—May 30th. High-tension switchgear with remote control, for the Melbourne City Council. See "Official Notices" March 28th.

May 16th.—One 15-ton overhead travelling crane, for the Melbourne City Council. See "Official Notices" May 2nd.

June 2nd.—20,000-volt H.T. switchgear and L.T. switchgear and accessories, for the Melbourne Suburban Railways. See "Official Notices" May 2nd.

June 11th.—Switchgear and instruments, for the Melbourne City Council. See "Official Notices" April 25th.

July 1st. Telephone instruments and submarine cable, for the P.M.G. See "Official Notices" to-day.

July 8th.—Common-battery switchboard, for the P.M.G.'s Department. See "Official Notices" to-day.

July 8th.—Rubber-covered wire, batteries, telephone switchboards, measuring instruments and telephone instruments, for the P.M.G. See "Official Notices" to-day.

TASMANIA.—June 9th. Telegraph and telephone material for the P.M.G.'s Department. See "Official Notices" May 9th.

QUEENSLAND.—May 21st. Copper wire and accessories, for the P.M.G.'s Department. See "Official Notices" April 11th.

August 27th.—Five sections of common-battery multiple switchboard, for the P.M.G.'s Department. See "Official Notices" to-day.

WESTERN AUSTRALIA.—May 28th. Condensing plant, pump and piping, for a Government power station at Perth. See "Official Notices" May 9th.

July 9th and 30th and August 6th.—Telegraph and telephone material, for the P.M.G.'s Department. See "Official Notices" to-day.

June 11th. Metal-filament lamps, for the P.M.G. See "Official Notices" to-day.

July 23rd.—Telegraph and telephone instruments, for the P.M.G. See "Official Notices" to-day.

SOUTH AUSTRALIA.—July 16th. Telegraph and telephone material, for the P.M.G.'s Department. See "Official Notices" to-day.

NEW SOUTH WALES.—July 9th. Switchboards, for the P.M.G. See "Official Notices" to-day.

Austria.—May 23rd. The Austrian State Railway authorities at Stanislau are inviting tenders for an installation of electric lighting and for a number of electric lifts at the new railway station buildings at Stanislau.

Barnes.—May 19th. Feeder and distributor cables, for the U.D.C. See "Official Notices" April 25th.

Belfast.—May 19th. Circulating-water pump, for the Corporation Tramways and Electricity Committee. See "Official Notices" April 25th.

Belgium.—May 20th. The municipal authorities of Schaerbeek, Brussels, are inviting tenders for a low-tension network of mains in connection with the electric lighting undertaking. Particulars from the Service de l'Electricité, 30, Rue de la Ruche, Schaerbeek.

May 24th.—The Belgian telegraph authorities in Brussels (La Salle de la Madeleine) are inviting tenders for telephonic apparatus for central-battery operation at the headquarters in Antwerp

Bulgaria.—May 29th. The District Administration of Finance in Sofia is inviting tenders for the supply of two boilers, two steam engines, three dynamos and an electric motor, with accessories, for the Bulgarian State Collieries at Pernik.

Colchester.—May 27th. Steam coal for a year (about 5,000 tons) for the Corporation electricity department. Mr. W. Frisby, Borough Electrical Engineer, 36, Osborne Street.

Croydon.—May 29th. Electric lighting of the fire station and library, Thornton Heath, for the Corporation. See "Official Notices" to-day.

Derby.—May 23rd. One 750-KW. motor-alternator, for the Corporation. See "Official Notices" May 9th.

Douglas (Isle of Man).—May 19th. Good steam coal (about 190 tons) double screened for the cable tramways. Mr. A. Robertson, town clerk.

Dundee.—May 30th. Steam and feed piping, steam feed pumps and hot-well tank, &c., for the Corporation electricity department. See "Official Notices" to-day.

Glasgow.—May 26th. Two steam turbo-alternators, with condensing plant (5,000 KW. and 2,000 KW. respectively), for the Corporation Tramways Department. See "Official Notices" April 25th.

Grimsby.—Pipework, extension of Klein cooling towers, conduits, seven-way D.P. distribution board and motor-driven rotary air and water extraction pumps and circulating pump, for the Corporation. See "Official Notices" May 2nd.

Leeds.—May 19th. Economiser chamber at the generating station, Whitehall Road; extension of engine room flooring at generating station, Whitehall Road. Specifications, &c., from 1, Whitehall Road, Mr. C. N. Hefford, engineer.

London.—L.C.C.—May 28th. Electrical installations at Lewisham Bridge and Fairfield Road (Bow) elementary schools. See "Official Notices" May 9th.

Applications are invited from persons and firms wishing to be included among those from whom the Council invites tenders for the supply of stores and the execution of general maintenance contracts. See "Official Notices" May 9th.

June 3rd.—High and low-tension cables for Tramways Department. See "Official Notices" to-day.

MILE END.—Two 30-KW. and one 15-KW. compound engines and dynamos, for the Guardians (from municipal authorities only). See "Official Notices" May 9th.

ROYAL MINT.—May 19th. 50 tons of copper in ingots. See "Official Notices" to-day.

METROPOLITAN ASYLUMS BOARD.—June 4th. Extension of internal telephone system and installation of signal bells at the Western Fever Hospital, Fulham, S.W. See "Official Notices" to-day.

Malta.—May 22nd. Arc lamp carbons. Receiver-General and Director of Contracts, Valletta. Forms, &c., from Crown Agents for the Colonies, Whitehall Gardens, S.W.

Manchester.—May 20th. (*a*) Canopy trolley standards; (*b*) steel fishplates for tramway rails; (*c*) steel tie bars for tramway rails; (*d*) pitch for paving purposes, for the City Tramways Committee. Mr. J. M. McElroy, General Manager, 55, Piccadilly.

Mexborough.—May 30th. Lancashire boiler, for the U.D.C. electricity department. See "Official Notices" April 25th.

New Zealand.—CHRISTCHURCH.—May 22nd. City Council. Two 500-KW. converters and switchboard panels. Tenders, c.i.f. Lyttelton, to office of High Commissioner for N.Z., 13, Victoria Street, S.W. Specification, &c., at Board of Trade C.I. Department in London.

Portsmouth.—June 11th. Wiring for electric light installation at Workhouse Infirmary extensions, &c., Milton. See "Official Notices" to-day.

Rathmines and Rathgar.—May 19th. Electrically-driven jet condensing plant, for the U.D.C. See "Official Notices" May 2nd.

Rochdale.—May 21st. Boiler feed pumps, for the Corporation Electricity Committee. See "Official Notices" May 2nd.

Salford.—May 19th. Tenders invited for 10 car bodies and 10 Brill trucks. Tramways General Manager, 32, Blackfriars Street, Salford.

Wiring of new secondary school, Pendleton, for the Education Committee. See "Official Notices" to-day.

South Africa.—STELLENBOSCH (CAPE PROVINCE).—June 4th. The Municipality is requiring tenders for buildings, generating plant, cables, public lighting, meters, &c., in connection with the electric lighting scheme. Specifications from Prof. Bohle, South African College, Cape Town.

Two 40-KW. Diesel engines and dynamos, pipework, battery, feeders, aerial cables, street lamps, &c.

Spain.—May 24th. The municipal authorities of Tabanera de Cerrato (Palencia province) are inviting tenders for the concession for the electric lighting of the town during a period of eight years.

May 29th.—Tenders are being invited by the municipal authorities of Almeria for the concession for the electric lighting of the town during a period of 15 years.

Tenders have just been invited by the municipal authorities of Urda (province of Toledo) for the concession for the electric lighting of the town during a period of 12 years.

Walthamstow.—May 28th. Natural draught cooling tower, for the U.D.C. Electricity Department. See "Official Notices" May 2nd.

CLOSED.

Barrow.—The B. of G. has accepted the tender of Mr. Drysdale, Barrow, amounting to £670, for the electric lighting of the workhouse.

Belgium.—Six German and two Belgian concerns competed for the contract, last week, for the supply of armoured high-tension cables required by the municipal authorities of Schaerbeek, Brussels, in connection with their electric lighting undertaking. The lowest tender was that of the Société des Ateliers de Constructions Electriques, of Charleroi.

Birmingham.—The Corporation has placed a contract with the Electro-Mechanical Brake Co., Ltd., of West Bromwich, for 40 Maley electro-mechanical brakes of a new design for maximum traction bogie trucks, after test of a trial brake. This is the second large order placed with the same company by the Corporation.

Blackburn.—The Corporation has placed a contract with the British Westinghouse Electric and Manufacturing Co., Ltd., for a turbo-generator for the electricity works.

Cheltenham.—The T.C. has accepted the tender of the British Westinghouse Co. for the new condensing plant at the electricity works, at £1,000.

Doncaster.—The Electric and Tramways Committee has recommended the acceptance of the following tenders in connection with the supply of new tramcars:—

United Electric Car Co., Ltd.—Car bodies, with top covers, at £456 each.
Peckham Truck Co.—Pendulum trucks, at £90 10s. each.
Dick, Kerr & Co.—Electrical equipments, at £284 10s.

Dover.—The T.C. has received the following tenders for 4,000 tons of coal (washed nuts) for the electric light works:—

W. Cory & Son.—17s. 9d. per ton.
Featherstone Colliery Co.—17s. 4½d.
Settle, Speakman & Co.—Queenboro' washed nuts, £1 1s.; and Pearl slack, 19s. 10d.
Myers, Rose & Co.—18s. 3d., with alternative prices ranging from 17s. 5d. to £1 0s. 2d.
Main Colliery Co., S. Wales.—19s. 7½d.
Mowll & Co. (Dover).—Washed steam smalls (Haigmore), 16s. 11d.; Hastings steam smalls, 16s. 11d.; and another kind, 17s. 5d.

A truck load of Mowll & Co.'s coal, at £1 1s. 5d. per ton for the sample, is to be tried, and if satisfactory, that firm's tender is to be accepted; otherwise, the contract is to be placed with the Featherstone Colliery Co., last year's contractors, at 15s. 2d. per ton.

Eastbourne.—The T.C. has received the following tenders for the supply and erection of a coal conveyor at the electricity works:—

Rownson, Drew & Clydesdale. (accepted)	Babcock & Wilcox, Ltd.
R. Dempster & Sons, Ltd.	E. Bennis & Co., Ltd.
Walton & Clough, Ltd.	G. Robson & Co.
Mechan & Sons.	Strachan & Henshaw, Ltd.
	Spencer & Co., Ltd.

The T.C. also received tender from the following for flame arc lamps for public street lighting:—

Electrical Co., Ltd. (accepted)	G. Braulik.
Engineering and Arc Lamps, Ltd.	Johnson & Phillips.
Maxim Lamp Works, Ltd.	Ridings Arc Lamp Co., Ltd.
Siemens Bros. Dynamo Works, Ltd.	Union Electric Co., Ltd.
Oliver Arc Lamp Co., Ltd.	Electrical Engineering and Equipment Co.
Jandus Arc Lamp and Electric Co.	

The question of the sale of the old lamps and transformers has been deferred.

Finchley.—At the last meeting of the U.D.C. the following tenders were received for the supply of a new oil engine for the electricity works:—

(1) Cole, Marchant & Morley, Ltd.	£2,650
(2) Willans & Robinson, Ltd.	2,857
(3) Burmeister & Wain, Ltd.	2,880
(4) Swiss Loco. and Machine Works	2,950
(5) R. Hornsby & Sons, Ltd.	3,051
(6) Consolidated Diesel Engine Co.	3,123
(7) Hick-Diesel Engine Co., Ltd.	3,147
Ditto (alternative for horizontal engine)	3,235
(8) M.A.N. Co. (vertical)	3,394
(9) Mirlees, Bickerton & Day	3,925

The Electricity Committee reported that tenderers Nos. 1, 2, 3, 6 and 9 had not agreed to any system of deferred payments; tenderers No. 4 offered an engine at 200 revs. per minute in place of a maximum of 180 as specified. They recommended that the tender of Messrs. Hornsby be accepted, their price, on a system of deferred payments (one-third on delivery, one-third 12 months after delivery, and one-third 18 months after delivery), being:—Engine, £3,428; generator, £834; bedplate, £65. In the discussion which ensued,

Councillor Nicholls asked if it was a fact that the reason for not accepting the lowest tender, £2,650, was that that tenderer would not supply an engine on the deferred-payment system. Councillor Syrett replied that machinery was a matter that required other consideration than figures. The Committee had to take into consideration the efficiency of the machine and economy in working. The engineer was satisfied that the engine recommended was the cheapest, taking everything into consideration. Councillor Butcher asked what was the spot cash price for the machine. It did not seem a very great business proposition for a Council like theirs to buy an engine on the hire-purchase system. Councillor Syrett replied that the spot cash price was £3,051 and the Council would have to pay £3,248. The principle had already been adopted by the Council. On two occasions the Council had sanctioned the purchase of an oil engine out of revenue. The only other method was by loan, for which the sanction of the L.G.B. must be obtained. That meant unnecessary delay and expense, besides adding to capital. The Council would have to pay 6 per cent. under the deferred-payment system. It was not at all unusual to buy machinery on the lines proposed. The Committee would have preferred to pay cash if it had the revenue, but it had not £4,000 to its credit. After it had paid off the final instalment, the revenue account would be in as good a condition as ever. The Committee's recommendation was eventually carried by six votes to four.

Glasgow.—The following contracts have been entered into for the ensuing 12 months by the Tramways Committee:—

Steel car wheels.—John Baker & Co., Ltd., and Hadfield's Steel Foundry Co., Ltd.
Steel tires.—Brown Bayley's Steel Works, Ltd.
Steel axles.—Glasgow Railway Engineering Co., Ltd.
V.I.R. cables.—Siemens Bros. & Co., Ltd., and B.I. & Helsby Cables, Ltd.
Chilled iron brake blocks.—Miller & Co., Ltd.
Fireclay goods.—Glenboig Union Fireclay Co., Ltd., and Currie & Co., Ltd.
Springs.—Geo. Turton, Platts & Co., Ltd., and L. Sterne & Co., Ltd.
Steel (tool, &c.).—Ibbotson Bros. & Co., Ltd., and L. N. Ledingham & Co.
Wrought-iron tubes, &c.—Stewarts & Lloyds, Ltd., and Scottish Tube Co., Ltd.
Cotton waste, &c.—Wm. Wiseman & Son, R. & W. Cuthbertson, and Jas. Paxton & Co.

Ordinary contracts closed included:—

Scrap copper, field coil, armature coils.—F. W. Harris.
Brass.—G. Bill-Gozzard.
Lead-covered cable.—Trainer & Allison.
Rubber cable.—Ballardie, Holden & Co.
Zinc and dry cells.—R. M. Easdale & Co.
Rubber.—John Wilson.
Cast-iron stopping place sign-posts and brackets.—J. & A. Law, Ltd.

The Electricity Committee recommends the acceptance of the following for 12 months:—

C.I. joint boxes, section pillars, &c.—Carron Co., Ltd.; Falkirk Iron Co., Ltd.; M'Dowall, Steven & Co., Ltd.
Fireclay bricks.—Heathfield & Cardowan Co., Ltd.; Glenboig Union Fireclay Co.
Wooden troughing and cover.—Robinson, Dunn & Co.
Malleable iron tubes and fittings.—Scottish Tube Co.

The T.C., at its next meeting, will be asked to approve of the following:—

It having been reported that the electrical engineer had completed an electric lamp for constables, which had been thoroughly tested and had given entire satisfaction; that the necessary plant for recharging the lamps had been fitted up, and that, to substitute electric lamps for oil lamps at present in use, 850 would be required, authority be granted to said engineer to obtain offers for additional lamps (100 being already in use), that official submitted six offers, and the sub-committee, having considered the same, agreed to recommend that 100 lamps be obtained from each of the following firms, viz.:—Messrs. Watson & White, Messrs. Ross & Co. and Messrs. Peto & Radford (per Messrs. Colin Scott & Co.).

Hereford.—The T.C. has accepted the tender of Callender's Cable and Construction Co., Ltd., for cables, at £833; and that of the Rees Roturbo Manufacturing Co., Ltd., for pumps and motors, at £415.

King's Lynn.—The T.C. has accepted the following tenders:—Messrs. Browett, Lindley & Co., Ltd., one 400-KW. high-speed steam engine, £1,289; steam, exhaust and feed pipes, foot-plates, &c., £427; the Rees Roturbo Manufacturing Co., Ltd., one rotary jet condensing plant, £305; the Phœnix Dynamo Co., Ltd., one 400-KW. dynamo, £500; total, £2,521. The Committee also accepted the tender of Mr. W. F. Smith, of King's Lynn, amounting to £778, for the erection of an additional boiler house.

Lancaster.—The T.C. has accepted the tender of Messrs. Milnes, Voss & Co. for two top-deck covers for tramcars, at £120 each.

London.—HAMMERSMITH.—The B.C. is to enter into a contract with the Main Colliery Co. for an annual supply of free burning coal to the Electricity Department, at 17s. 6d. per ton.

BATTERSEA.—The B.C. has accepted the tender of the Rees Roturbo Manufacturing Co., at £955, for additional pump-house plant at the generating station.

SOUTHWARK.—The following tenders have been received by the B.C. for machinery required in connection with the plant extension at the electric lighting station:—

CONDENSING PLANT AND COOLING TOWER.

	Condenser.	Cooling tower.
Klein Engineering Co.	£4,136	—
Worthington Pump Co.	3,570	—
Rees Roturbo Co.	3,895	—
Isaac Storey	3,180	—
" " (alternative)	3,030	—
W. H. Allen & Co., Ltd.	4,382	—
Cole, Marchant & Morley	3,576	—
Mirrlees Watson & Co., Ltd.	3 450	—
Davenport Engineering Co.	3,505	2,257
" " (alternative)	3,418	2,187
Balcke & Co., Ltd.	—	2,199
Kater & Ankersmit	—	1,085

WATER-TUBE BOILERS.

British Niclausse Co.	£6,926
Stirling Boiler Co.	6,293
" " (alternative)	6,634
Babcock & Wilcox, Ltd.	6,147
" (alternative)	6,629
Howden & Co. "	5,690
Clarke, Chapman	6,853
" " " (alternative)	7,171
" " "	7,337

TURBO-GENERATORS, ROTARY CONVERTERS AND SWITCHBOARD.

	Turbo-generators.	Rotaries.	Switchboard.
Oerlikon Co.	£8,196	£7,175	—
" (alternative)	—	5,515	—
Dick, Kerr & Co., Ltd.	9,395	5,414	£948
Howden & Co., Ltd.	8,495	9,935	—
" " (alternative)	8 342	—	—
General Electric Co., Ltd.	7,930	4,030	861
" " (alternative)	8,952	3,626	—
" " "	7,820	3,439	—
C. A. Parsons & Co., Ltd.	10,546	—	—
Siemens, Ltd.	8,080	4,400	640
" " (alternative)	7,734	3,548	—
Brit. Thomson-Houston Co.	8,873	4,009	838
Willans & Robinson, Ltd.	7,710	10,180	867
" " (alternative)	7,740	—	869
" " "	8,030	—	—
" " "	8,080	—	—
" " "	8,810	—	—
British Westinghouse Co.	8,885	4,620	826
Vickers, Ltd.	—	4,460	—
" " (alternative)	—	3,832	—
Brush Electrical Co.	8,997	—	—
Richardsons, Westgarth and Co., Ltd.	8,704	—	—
" " (alternative)	8,330	—	—
" " "	8,700	—	—
" " "	8 304	—	—
Fraser & Chalmers	8,424	—	—
" (alternative)	8,486	—	—
Whiop & Bourne	—	—	725
Electric Construction Co.	—	—	6 2
Bertram Thomas	—	—	517
Ferranti, Ltd.	—	—	827
Union Electric Co.	—	—	691

The Electric Light Committee recommends the acceptance of the following tenders:—

General Electric Co., Ltd.—Two 1 500-KW. turbo-generators and rotary converters, £7,920 and £4,080 respectively.
Bertram Thomas.—Switchboard, £517 (provisionally).
Davenport Engineering Co.—Surface condensing plant and cooling tower, £3,418 and £2,187 respectively.
Babcock & Wilcox, Ltd.—Boiler plant, £6,147.

The Committee stated that, as would be observed, it had not recommended the acceptance of the lowest tender in each case, but, acting on advice, had selected those firms whose machinery was best suited to the work of the station. The recommendations were agreed to.

Manchester.—The Corporation Tramways Committee has accepted the following tenders:—

R. Johnson, Clapham & Morris, Ltd., Manchester.—Block tin.
Normanton & Son, Ltd.—Roofing over of the avenues at the Hyde Road car works.
B.I. and Helsby Cables, Ltd.—Tramway rail bonds.
F. Smith & Co., Ltd.—Copper trolley wire.
British Mannesmann Tube Co., Ltd.—Steel tramway poles.
Naylor Bros., Ltd.—Span wire brackets.

The following tenders have been accepted by the Corporation Electricity Committee:—

Reavell & Co., Ltd.—Air-compressing plant for boiler tube cleaning.
W. T. Henley's Telegraph Works, Ltd.; Messrs. Siemens Bros. & Co., Ltd.; I.R., G.P. and T. Works Co., Ltd.; and Charles Macintosh and Co., Ltd.—Paper-insulated and rubber-insulated cables.

Morley.—The T.C. has accepted the tender of Messrs. Bedford & Co. for 1,000 tons of pea slack for the electricity works.

Rochdale.—The Corporation Gas and Electricity Committee, on May 7th, placed contracts for 60,000 tons of coal. The prices showed a very substantial increase over last year's figures, when £2,777 more was paid on this account than in the previous year. On the contracts now placed there is an average advance of just over 1s. 1d. per ton, or an aggregate increase of over £3,250.

Rugby.—The tender of Mr. S. P. Marsh, Rugby, has been accepted for the electric light installation at New Empire Picture House, now in course of erection in Henry Street.

Salford.—The Electricity Committee has accepted the following tenders:—

Lancaster & Tonge.—Brass and gun-metal castings.
British Electric Transformer Co., Ltd.—Three compensator transformers for the meter house, in connection with the bulk supply of electricity, £299 each.
W. T. Glover & Co., Ltd.—Extra-high-tension cable.
Bell Bros.—Crank chamber oil, 1s. 2d. per gallon, value £393.
M. Wells & Co., Manchester.—Turbine oil, 1s. 6d. per gallon, value £110.
Stern, Sonneborn Oil Co.—Black oil, 11d. per gallon, £50.
Baxendale & Co.—Wrought-iron tubes and fittings, £60.
L. Andrews & Co.—Mica, rubber gloves, &c., rubber caps, £74.
N. British Rubber Co., Ltd.—Rubber overshoes, 2s. per pair, £2.
Wm. Geipel & Co.—I.R. cables (£200), twin flexible cable (£17), plain white tape (1s. 6d. per lb., £12).
W. T. Glover & Co., Ltd.—I.R. cables (£1 0), multiple-core cables (£300).
John Bassett.—Tin and lead (£150).
Albion Clay Co., Ltd.—Stoneware conduits, stoneware pipes, cable protectors and bearers (£70).
W. H. Keys.—Bitumen (£4 9s. 6d. per ton, total £240).
W. T. Henley's Telegraph Works Co., Ltd.—Rubber strip (7s. 6d. per lb., £72) and black bitumen compound adhesive tape (£8).
T. Hart.—Cotton driving rope (£46).

Worcester.—The City Council has accepted the tender of Messrs. Hough & Jacobsen, Birmingham, at £273, for supplying to Hylton Road electricity station induced-draught fan, ducts, dampers, platform, &c.

Sheffield.—The City Council has accepted the following tenders :—

Willans & Robinson, Ltd.—Turbo-alternator, £23,119.
Stirling Boiler Co., Ltd.—Three water-tube boilers, mechanical stokers, superheaters, economisers, pipework and other accessories, £26,208.
Longbottom & Co.—5,000 tons steam coal for the electricity department.
Edmund Taylor.—Excavations, retaining walls and extensions to waterway at Neepsend power house site, £19,718.
United Electric Car Co., Ltd.—25 double-deck top-covered extended canopy cars, £630 per car, plus 5 per cent. for contingencies.
British Thomson-Houston Co., Ltd.—R G E 20 motors for above cars, £105 each; also B. 13 C. controllers for ditto, £23 16s. each.

South Africa.—The *African World* states that Germiston municipality has now decided the tenders for the railless traction system, the successful contractors being :—

Hubert Davies & Co.—10 Cedes-Stoll cars, £11,400; overhead fittings, £1,328: and poles, £6,899.
Connocks S.A. Motor Garage.—Tower wagon, £875.
Telegraph Manufacturing Co. (Colonial), Ltd.—Electric mains, £4,054.
S. Sykes & Co.—Motor converters, £3,272; and spare stator, £450.

All are Johannesburg firms.

Tunbridge Wells.—The following tenders have been accepted by the T.C. for an annual supply of coal to the Electricity Department :—

Myers, Rose & Co.—Bwlfa large, 26s. 2d. per ton.
Main Colliery Co., Ltd.—Dynevor Duffryn, 25s. 8d.
Harris, Hardman & Co., Ltd.—South Hetton, 19s. 3d.
Wm. Cory & Sons, Ltd.—Shirebrock nutty slack, 18s. 7d.

Walsall.—The following tenders have been accepted by the T.C. :—

E. Green & Son.—Economiser, £623.
Callender's Cable Co., Ltd.—Laying alternating-current main, £601.
British Westinghouse Co., Ltd.—Sub-station equipment, £167.
Johnson & Phillips, Ltd.—Ditto, £16 10s.
Walsall Electrical Co., Ltd.—Overhead telephone wires, £14.

Winchester.—The T.C. has accepted the tender of Messrs. Wise & Lansdell, Ltd., for the erection of new offices and stores at the electricity works, at £1,697.

York.—The T.C., on May 9th, accepted the tender of Callender's Cable and Construction Co., Ltd., for high-tension cables, at £2,137; and that of the Brush Electrical Engineering Co., Ltd., for four tramway cars, at £2,960.

FORTHCOMING EVENTS.

Physical Society.—Friday, May 16th. At 8 p.m. At the Imperial College of Science, South Kensington, S.W. Paper on "Some Experiments to Detect β-rays from Radium A," by Drs. W. Makower and S. Russ.

Junior Institution of Engineers.—Friday, May 16th. At 39, Victoria Street, S.W. Discussion on "Electrical Propulsion of Ships," introduced by Mr. W. P. Durtnall.

Wednesday, May 21st. At 8 p.m. At the I.E.E. Paper on "Heat Accumulators and their Use in Exhaust Steam Turbine Plants," by Mr. A. Alison.

Friday, May 23rd. At 39, Victoria Street, S.W. Discussion on "The Organisation of an Engineers' Employment Bureau," introduced by Mr. S. M. Hills.

May 24th. At 8 p.m. Visit the King George reservoir at Chingford.

Institution of Electrical Engineers (Newcastle Students' Section).—Monday, May 19th. At 7.30 p.m. At Armstrong College. Annual general meeting.

May 20th—24th. Visit to Paris.

Royal Society.—Thursday, May 22nd. Annual Bakerian Lecture, by Sir J. Thomson, F.R.S.

Concrete Institute.—Thursday, May 22nd. At 4.30 p.m. Annual general meeting. At 8 p.m. Annual dinner.

Royal Institution of Great Britain.—Friday, May 23rd. At 9 p.m. Discourse on "The Secret of the Permanent Magnet, by Prof. S. P. Thompson.

Saturday, May 24th. At 3 p.m. Lecture on "Radioactivity: the Alpha Rays and their Connection with the Transformations," by Prof. E. Rutherford.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—Lieut.-Col. H. M. Leaf.

The following orders have been issued for the current week :—

Monday, May 19th.—"A" Company. Infantry drill, 7 to 9 p.m.; technical instruction for all members on the 6th rate, and for all candidates for higher rating, 7 to 9 p.m.; musketry instruction, 9 to 10 p.m.

Tuesday, May 20th.—"B" Company. As for "A" Company.

Wednesday, May 21st.—All Companies. Annual course of musketry at Purfleet rifle ranges. Railway tickets will be sent to those notifying headquarters of their intention to attend.

Thursday, May 22nd.—"C" Company. As for "A" Company.

Friday, May 23rd.—"D" Company. Ditto.

Saturday, May 24th.—Headquarters will be opened for regimental business from 10 a.m. to 12 noon.

(Signed) P. H. Campbell, Capt. R.E., and Adjt.
For Officer commanding L.E.E.

NOTES.

Wanted—Six Hundred Pounds.—Our readers are already aware that at the annual festival dinner Mr. E. G. Byng offered to give £100 to the funds of the Electrical Trades Benevolent Institution, if nine other firms or gentlemen would do the same within three months from April 16th. The £100 which Mr. Sutton had already given was to be counted as one of the nine; Mr. H. Hirst, through Mr. Sutton, promised a like amount; and Mr. Garcke's promise brings the total up to £400 out of the required £1,000.

It has been thought that some of our generously disposed readers would be willing to follow the splendid example set by these gentlemen and ensure that the conditional offers are fulfilled by making or influencing six other offers. We hope that in later issues it will be possible for us to fill names into the six spaces now standing vacant below :—

1	Mr. E. G. Byng	£100
2	Mr. G. Sutton	£100
3	Mr. H. Hirst	£100
4	Mr. E. Garcke	£100
5	*	
6	*	
7	*	
8	*	
9	*	
10	*	

Walking Race.—We are informed that the second annual London to Southend-on-Sea 41¾ miles Amateur Walking Race, promoted by the Hackney Walking Club, a club which was formed as a result of the Electrical Trades London to Brighton Walking Race in 1911, took place on Whit Monday, and was the means of bringing to light two excellent novice walkers in S. C. Haynes, of the Associated Fire Alarms, Ltd., and C. H. Malivoire, of the Crypto Electrical Co., who finished first and second respectively. The event, for which no entrance fee was charged, was most interesting throughout, for the first three positions were ever in doubt right to the finish, so close together at times were the leading men. Eight entered, six started, and five finished, Swann, of Southend, retiring at 20 miles, suffering with cramp in the legs. Result :—S. C. Haynes (Associated Fire Alarms, Ltd.), 7 hr. 54 min. 9 sec., first; C. H. Malivoire (Crypto Electrical Co.), 7 hr. 57 min. 16 sec., second; J. H. Williamson (Manchester), 7 hr. 59 min. 25 sec., third; A. Weston (Clapton), 8 hr. 56 min. 50 sec., fourth; W. J. Spayne (Upper Tooting), 9 hr. 22 min. 6 sec., fifth. The record for the course (6 hr. 47 min. 37½ sec.) is held by Mr. A. R. Edwards, late of the May-Oatway Fire Appliances, Ltd. It is probable that a London to Brighton, or 100 kilometres race, may be held in September.

Copper.—Messrs. Merton's circular giving statistics for April 30th shows further reductions in visible supplies during the month. English stocks are less by 763 tons. French stocks are less by 311 tons. Stocks in England and France, and afloat from Chile and Australia, stand at 30,437 tons, a reduction of 1,824 tons on the quantity for March 31st.

Total European stocks, including Rotterdam, Hamburg and Bremen, and estimated stocks in other European ports stand at 45,828 tons, a reduction of 1,746 tons on the quantity for end of March. European arrivals from North America were considerable at 33,628 tons, the average being 27,600. Spain and Portugal to England and France were low; to other countries average. Chile shipments were average, Australian low at 2,950 tons (average for past 12 months 3,790 tons). Deliveries, at 45,932 tons, are fairly high, the two preceding Aprils showing 43,000 and 39,000 tons.

American stocks for the end of March were 46,550 tons, or 8,050 tons lower than on February 28th. The world's visible supply on the same date was 91,624 tons, a reduction of 7,649 tons on the quantity for February 28th.

Returns made by the American Copper Producers' Association, quoted by the *Times* of 9th inst., show a decrease in stocks during April of 12,800 tons, the largest decrease for any month since January, 1910, when the drop was 19,000 tons. The total deliveries during April were 73,000 tons, the largest recorded. Of these, home consumers took 35,000 tons, and export 38,000. The production during April amounted to 60,000 tons, less than in March, when it was 60,800 tons.

Commenting on the general situation, a writer in the *Financier* of May 9th points out that the statistical position, combining with a more favourable situation in Europe, is in favour of higher prices. The same article refers to a combination formed to maintain the price of iron, and says that a "somewhat similar combination has taken place with regard to copper." The buyer, however, is hampered by dear money. The general conclusion is that, however the various adverse conditions on this side may affect commercial concerns, the political atmosphere in the States should continue to improve, and with it activity in industries. Naturally, as the largest copper producer, America must strongly influence the market.

Electricity in the U.S. Navy.—The Navy Department has recently established an electrical school at the Navy Yard at Brooklyn for the training of marines for electrical work. It is estimated that in a crew of one thousand men on a modern war vessel over 40 skilled electricians will be found.

Parliamentary. — METROPOLITAN ELECTRIC TRAMWAYS (RAILLESS TRACTION) BILL.—Sir Ivor Herbert's Select Committee of the House of Commons has found the preamble of the above Bill proved; the Bill gives the company power to establish a system of railless traction from Finsbury Park, eastward through Tottenham to a junction with the Walthamstow tramway system, and also contains clauses for the sale or transfer of the undertaking to the Middlesex County Council, which is the tramway authority for the county. The chief opposition came from the Lea Navigation Conservancy Board, in regard to the bridge over the Lea at Tottenham, but matters were adjusted between the parties.

In the House of Commons, on May 6th, the Northern Counties Electricity Supply Bill was read a third time, and in the House of Lords, on May 5th, the following Bills passed third reading:—Wimbledon and Sutton Railway Bill, London Electric Railway Bill, the Metropolitan District Railway Bill, and the Porthcawl and District Gas and Electricity Bill.

Accident.—John Stead, of Halliwell Street, Milnrow, was engaged in repairing an electric wire at the premises of the Milnrow Spinning Co., when a pair of pliers fell on to the wires. The flare caught Stead in the face and burned him badly about the eyes. After being treated by a medical man he was removed to the Rochdale Infirmary and detained

What Canadian Correspondents think of Canada.—A young man (non-electrical) who went out to Canada some 10 years ago and has had to rough it, experiencing serious privation, in a brief personal note writes from Alberta:—"Am glad to hear that . . . . has emigrated to this part of the world, for this is certainly some country. I came to . . . . first in 1910, when there was but one house here and that a log building. To-day there are over 2,000 inhabitants, all fairly prosperous. We have a large stone school-house, two banks, two hotels, a newspaper, a town hall, a fire brigade, four churches, a "co-op.," and one policeman. I will send you a copy of our local paper to make you laugh. The ridiculous items, the dogmatic tone of the leaders, the misspells, are common to every paper in the country, and yet each person seems to have had a fair education. Art and literature are at a discount, but science is at a premium. The kids play with miniature aeroplanes, wireless telegraphs, motors, internal combustion engines, &c.; the toys we used to play with—hoops, tops and marbles—are quite unknown."

A friend, who went over from British electrical engineering work to one of the leading cities of Canada some three years ago, delivers himself thus:—

"I am still not enamoured of this country, and would fain return to dear old England if a chance should arise. Do you think that any home firms doing, or desirous of doing, business with Canada, would have any opening at home for a man with Canadian experience, a knowledge of Canadian ways, methods and character? Beyond the mere fact that I earn my living here, there is nothing which tempts me to stay—perhaps both my wife and I are too fond of the Old World to settle down here well; we are fond of historical scenes and old associations which have no existence here; besides, there are few people here who have any ideas at all beyond making money. A knowledge and love of music, painting, sculpture, literature, &c., are very rare indeed, and few people can talk about anything except their own 'shop.'"

Another correspondent, who went out to Canada from England five years ago, after many years' experience with municipal electrical and tramway systems as charge engineer, installation inspector, &c., as well as in machine shops, both in electrical and general mechanical engineering, writes from Alberta:—

"I never, in all that time, sought association with the Institution of Electrical Engineers, as I found so many fellows with scarcely knowledge enough to put up a ceiling rose, pluming themselves with A.I.E.E. on their visiting cards, and I got disgusted at the farce of it all, particularly as I found other men whose experience and learning made them stand high in their profession, little caring whether they were known as M.I.E.E.'s or not. However, five years in Canada has changed all that, for out here, where brains and learning are at a discount, and the biggest bluffer gets the most pay, I have come to the conclusion that the only way to make headway is to cram your abilities down people's throats, and make them see that you are 'Someone great.' I have had quite a few jobs since I came out here, and seen examples of electrical work that would make your hair stand on end, yet the salaries paid to the men that did them would make many a 'chief's' mouth water

"As this place develops they will want a lighting scheme laid out for the town, and a tramway system when the place grows to warrant it, besides large mining plant. I have built a little office, and am selling farm machinery and doing repairs, while I hold my 320-acre farm eight miles away. It's pretty hard work, but I hope the reward is coming, and if I can just have the A.M.I.E.E. as a bit of extra weight at the end of my club, I believe I can drive it into the heads of some of those ignorant financiers that there's a man on the spot capable of doing the work as well as, if not better than, anybody they can get from Montreal or New York.

"With good wishes for the continued success of the ELECTRICAL REVIEW."

Another correspondent (also non-electrical) writing from Vancouver eight months after his arrival, says:—

"After eight months you can imagine me as quite an 'old timer,' long enough out to feel quite at home, and imbued with the infectious optimism that surely permeates and enters into the heart of the man who steps out of the more confined atmosphere, into a Land of Promise. It is a thing that I have never ceased to wonder at, the spirit of hope that prevails, a man will quit his job, be absolutely 'up against it,' and yet look smiling; he may be sweeping roads one day, a dry-goods clerk the next, and getting tired of that, try his hand at farming; and so the glorious uncertainty goes on, ending, perhaps, by his 'striking good,' and earning enough to take a trip home to the Old Country; returning, of course, to start the same experience all over again.

"For my own part, having a definite end in view, I am running no such risks, but holding to my present situation with the ——. They are a fine firm, and treat me well; and I hope to gain the necessary experience from them to enable me, when I can manage it, to strike out on my own account.

"Like most 'green ones' just out, I was tempted to buy a small portion of B.C. (33 × 120), but, so far, have not been able to sell again, yet sharing the everlasting hope of all others who dabble in Real Estate, hope to realise at an unheard-of profit, and live happily ever afterwards.

"The short time that I have been here has been a busy time as regards the building that is going on in and around Vancouver; the place is growing at a remarkable pace. The B.C. Electric Railway, who own the tram system, are extending in every available direction. They have the 'Pay-as-you-enter' system, but the overcrowding at certain times of the day is a sight for the gods. As long as you can get at least one foot on, or hang on at the back, you may ride.

"From the door of my little bungalow I have a grand view of the mountains, snow-topped, and every morning on my way to work I have only to 'look up' to receive an inspiration.

"We Englishmen out here have to drop the Old Country way of talking to a great extent, and it is a case of coming to Rome and doing as Rome does. The average Canadian has no love for the man from England unless he is prepared to be as 'one of them,' and I must say, without conceit, they have treated me very kindly and will always do so as long as I let the impression remain in their minds that 'England belongs to Canada; and not Canada to England'"

Institution and Lecture Notes.—INSTITUTION OF ELECTRICAL ENGINEERS.—The Council has awarded two Salomons Scholarships of the value of £50 each, one to Mr. Grahame George Dawson, of University College, London; and one to Mr. Robert Burleigh, of the City and Guilds (Engineering) College, South Kensington; and a David Hughes Scholarship of the value of £50 to Mr. John Harsant Lee, of King's College, London.

The Institution Premium, value £25, has been awarded to Mr A. E. Hadley, for his paper, "Power Supply on the Rand"; the Ayrton Premium, value £10, to Mr. F. H. Whysall, for his paper, "The Use of a Large Lighting Battery in connection with Central Station Supply"; the Fahie Premium, value £10, to Mr. A. J. Aldridge, for his paper, "Practical Application of Telephone Transmission Calculations"; the John Hopkinson Premium, value £10, to Dr. E. Rosenberg, for his paper, "Self-Synchronising Machines"; the Kelvin Premium, value for this year £21, to Messrs. C. C. Paterson, E. H. Rayner and A. Kinnes, for their paper on "The Use of the Electrostatic System for the Measurement of Power"; the Paris Premium, value £10, to Mr. J. S. Peck, for his paper, "Earthed *v.* Unearthed Neutrals on Alternating-current Systems"; an Extra Premium, value £10, to Mr. M. Solomon, for his paper, "Yellow Flame Arcs"; and an Extra Premium, value £5, to Dr. A. C. Michie, for his paper, "The Formation of Deposits in Oil-cooled Transformers."

Students' Premiums, value £10 each, have been awarded to Mr. H. R. Constantine and to Mr. J. Hacking; and £5 each, to Messrs. C. H. Goulden, S. N. C. K. Whitehead, P. Grice and A. T. Robertson.

On Friday, May 30th, at 8.30 p.m., or immediately after the conclusion of the annual general meeting, called for 8 p.m., a paper on "Practical Application of Telephone Transmission Calculations," is to be read by Mr. A. J. Aldridge.

VICTORIAN INSTITUTE OF ELECTRICAL ENGINEERS.—The report of this Australian Society for the 1912 session shows satisfactory progress. Seven papers were read on various subjects, including the licensing of wiremen, storage battery practice, electrical cooking and heating, the Diesel engine, and so on. A premium of five guineas was awarded to Mr. Victor Nightingall for his paper on "Electric Cooking and Heating." There is a balance of £148 in hand.

The question of amalgamation with the New South Wales Association was referred to by the president of the Victorian Institute at the annual meeting of the latter body at Melbourne. Mr. J. H. T. Brearley, in reviewing the year's work, said there was now a large section of the New South Wales Association desirous of bringing about amalgamation and the formation of an Australian Institute. The annual report stated that the membership of the Institute was now 165. Mr. W. J. Newbigin was elected president for 1913; Prof. Payne and Mr. W. H. Alabaster were appointed vice-presidents; Mr. A. E. Pepper was chosen as honorary treasurer.

LIVERPOOL AND DISTRICT AMATEUR WIRELESS ASSOCIATION.—The usual fortnightly meeting of this Association was held at the Creamery Café, 56, Whitechapel, on May 8th. We are informed that there was a crowded attendance, and a number of new members were nominated. The meeting was a free and easy one; the members had been invited to bring some pieces of apparatus for exhibition and discussion, and this request was well responded to, making a very interesting display. There was also Morse code practice, elementary and advanced. The next meeting will be held at the same Café, on Thursday, May 22nd, at 8 p.m. Communications to Mr. Samuel Frith, 6, Cambridge Road, Crosby, Liverpool, the hon. secretary.

TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION.—The Congress of this Association takes place at Blackpool on June 12th and 13th. The papers announced are:—"Possibilities for Increasing Profits on Interurban Lines," by Mr. E. H. Edwardes; "Tramways—a *Résumé*," by Mr. F. Bland; "Railless Traction and Motor-Buses," by Mr. H. England; "Standard Rules for Motormen and Conductors," by Mr. A. V. Mason.

ROYAL INSTITUTION.—On Saturday, May 24th, Prof. Rutherford commences a course of three lectures on "Radioactivity":—(1) "The Alpha Rays;" (2) "The Origin of the Beta and Gamma Rays;" (3) "The Radioactive State of the Earth and Atmosphere." The Friday evening discourse on May 23rd will be delivered by Prof. S. P. Thompson, on "The Secret of the Permanent Magnet."

THE CONCRETE INSTITUTE.—A paper by Mr. Harold Cane, entitled "The Stability of Brick Chimneys," was read at the meeting on May 8th. The annual general meeting of the Institute will take place on May 22nd.

Appointments Vacant.—Assistant station superintendent at Edinburgh (£200); switchboard attendant for Bray U.D.C. (20s.); electrician, for Abertillery U.D.C; electrical engineer (£120 +), and electrician attendant (£40 +), for the County Asylum, Rainhill, near Liverpool; manager, for the Redditch electricity works (£300). See our advertisement pages to-day.

The National Physical Laboratory.—The annual meeting of the general board of the National Physical Laboratory was held recently at the rooms of the Royal Society, when the report and accounts for the year 1912 and the statement of work for 1913 were presented and approved for transmission to the President and Council of the Royal Society. In former years this meeting has usually been held at Teddington during the month of March, and has been combined with an inspection of the Laboratory by the members of the board. In consequence of a change in the financial year, the annual inspection will in future be held at a later date. This year it is to take place on Thursday, June 26th, when the Right Hon. A. J. Balfour will open the new buildings recently erected.

These buildings complete a scheme initiated in 1909 to provide laboratories for metallurgy and optics, with administrative offices, at an estimated cost of £30,000, exclusive of equipment; of this sum the Treasury undertook to provide £15,000 provided the remainder were forthcoming from other sources. In 1910 the late Sir Julius Wernher generously presented £10,000 for the erection of the metallurgy laboratory, and on learning lately that the actual cost had exceeded the sum available by £936, Lady Wernher kindly defrayed the deficit.

To secure the further sum necessary for the completion of the scheme, and to obtain funds for the equipment of the buildings, an "Additional Funds Committee," of which the late Sir William White was chairman, was appointed during 1912. In its report this Committee states that the Royal Commissioners for the Exhibition of 1851 generously gave a donation of £5,000 to the building fund, thus completing with the gift from Sir Julius Wernher the £15,000 required to meet the Treasury grant.

General help towards the equipment has been received from many sources, including a number of the city companies. The Committee, however, points out that considerable sums are still necessary to provide adequately the equipment which is essential for the proper development of the work.

The Report of the Laboratory for the year 1912 contains as usual matter of great technical interest, with which we hope to deal on a future occasion.

Water-Tube Boilers in Canada.—In the last few years some of the leading firms of boiler makers in the Dominion have turned their attention to the manufacture of water-tube boilers, chiefly of the Heine, Atlas and similar types with water legs built up of wrought-steel plates and stays. Recognising the increasing demand for the sectional type and the numerous inquiries received for this pattern, a large and well-established firm in Western Ontario has entered the field with a boiler somewhat similar to the "Continental" type, as described in our issue of November 6th, 1908, but with this difference, that the forged-steel headers are made either with internal hand-hole plates or with the hand-holes flanged outwards, to suit the requirements of any particular customer, and the cross box is forged solid out of a steel plate instead of being riveted together. To carry out this work, new plant was installed, a large and powerful hydraulic press being purchased in the United States, but the supplementary hydraulic machinery and other special appliances have been made by the firm in their engine works. The general design of the plant and details of the header-making and other machinery were prepared by Mr. A. Venning, late of the Water-Tube Boiler Co., London, who is at present residing in Preston, Ontario. We understand that other firms abroad are also considering the manufacture of this pattern of boiler, recognising the superiority of its design and working qualities.

The "Yorke" Wiring System.—Many of the principal castles and country houses of Scotland, and not a few further south, are fitted with electric light on a system peculiar to the contractor who installed it, some 10 to 15 years ago—the late Mr. R. F. Yorke, of Glasgow and Stirling.

All of them—about 50 altogether—are run either by water-power or by an oil engine. The plant as a whole does not call for particular notice, though in most cases it has points seldom met with nowadays. For instance, where oil engines are used they are started by motoring the dynamo; and the battery is generally fixed up at the house, away from the plant, two switchboards being used. More distinctive was the practice Mr. Yorke usually adopted of charging the two halves of the battery in parallel, and discharging it in series. The resultant working pressure appears to have been rather a matter of chance, 60, 75 and 90 being the voltages most usual.

It is, however, his wiring system which presents the most unusual and interesting features. Briefly, it may be considered as a clumsy but quite effective forerunner of modern metal-sheathed single-wire systems, inasmuch as its chief feature was an earthed return, without the complicated special fittings and switchgear which at that date formed essential parts of all concentric systems. It was simplicity itself, consisting of a single insulated wire or cable of suitable capacity run throughout in compo tubing. Each length of tubing was carefully soldered to the next, so as to ensure perfect electrical continuity. But it was not entirely relied upon for the earthed return, being supplemented by a bare copper wire, run sometimes inside and sometimes outside the tubing. This copper wire was, as a rule, single and smaller than the insulated conductor, the compo tube being supposed to make up the difference in current-carrying capacity of the two. It was connected at suitable points—such as behind fuseboards—to an earthplate, to which the compo was also soldered, and served as a convenient means of connecting up to the earthed terminals of switches and fittings, which were standard throughout.

The net result was a simple and efficient installation, cheaply erected and durable; its only disadvantages, as compared with modern systems, were a certain clumsiness and poor mechanical protection. The tubing, too, being of compo, would be liable to melt should arcing be set up as the result of a fault on the inner conductor, and might thus be a source of fire danger under certain conditions. Developed, however, in accordance with modern experience, it certainly has in it the basis of an ideal system for the class of work for which it was designed.—H. R. T.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. PAGE having obtained another appointment, the Worcester Corporation was recommended by its electrical engineer to promote the other members of the staff with the following salaries: MR. H. H. SMITH, from £125 to £150, rising by annual increments of £10 to £180; MR. H. BAYNHAM, £91 to £104; MR. J. ADDYMAN, £78 to £91, rising to £104 in six months; MR. R. POWELL, £65 to £78; MR. R. F. SEWARD, just appointed at £65. Mr. Clarke (the chairman of the Committee) said that the successful issue of the undertaking was nearer than many of them thought. Mr. Fairbairn said the salaries were no more than should be paid by any self-respecting Corporation. The recommendations were carried with one dissentient only. Mr. Page was chief assistant.

The E.L. Committee of the Coventry T.C. has recommended the Corporation to increase the salary of the electrical engineer and manager, MR. G. TOUGH, from £550 to £650 per annum.

The Whitby U.D.C. on May 6th confirmed the appointment of MR. J. W. PIGGOTT as electrical engineer at £130 a year, rising to £150.

The Gillingham (Kent) T.C. has renewed the agreement with the borough electrical engineer (MR. CHALMERS) at the present salary of £300 a year, his commission on the gross profits to be increased from 1 per cent. to 1½ per cent.

The Crewe T.C. has appointed MR. W. M. TRUMP, of the staff of the Midland Electric Corporation, as charge engineer at the electricity works, vice Mr. A. H. Smith, who has taken up an appointment with Salford T.C.

MR. COLBECK, assistant mains engineer at the Dover Corporation Electricity Works, has resigned.

MR. NAYLOR, who held the appointment of chief assistant at Nelson has been appointed electrical engineer in place of Mr. Helme who recently died; MR. R. H. THOMPSON has been appointed station superintendent and MR. J. STANWORTH mains superintendent.

The Wakefield T.C. have increased the salary of Mr. J. VARCY, mains engineer, from £140 to £150 per annum, and advanced the commission of the Commercial Manager, MR. S. W. GARSIDE, from ¾d. to 1d. per 30 watts of additional supply secured.

The Glasgow electricity department has recommended the following increases of salary:—MR. W. W. LACKIE, chief engineer, £1,000 to £1,100; MR. ARCH-PAGE, chief assistant, £600 to £650; and MR. R. B. MACCALL, chief clerk and accountant, £375 to £400.

MR. E. W. FOWERAKER, senior switchboard attendant of Walthamstow Council Electricity Works, has been appointed fourth engineer-in-charge to the Ilford Council undertaking.

Tramway Officials.—At a meeting of the Southport Town Council last week a recommendation was brought forward that MR. B. ANDREWS should be appointed manager of the Corporation tramways undertaking, and that the services of the deputy tramways manager, MR. T. J. KENDREW, should be dispensed with. An amendment was moved that Mr. Kendrew should be appointed tramway manager, and this was carried by 23 votes to 16.

The staff and employés of the Cork Electric Tramway Co. last month presented a marble clock to MR. J. PERICHO, traffic super-

intendent, on the occasion of his marriage. The presentation took place in the Men's Recreation Room at the power house, being made by Motorman Kelleher, Mr. George Davies presiding.

General.—The staff of Messrs. Ackroyd & Best, Ltd., miners' safety lamp makers, electrical engineers and ironfounders, have presented Mr. S. Reid, A.M.I.E.E., with a marble clock on the occasion of his marriage.

Mr. C. H. Armstrong has severed his connection with the Reason Manufacturing Co., Ltd., of Brighton, with which firm he has for some time past held the position of their representative in the Lancashire district.

Mr. A. W. Makovski, electrical engineer of Reigate, has been elected chairman of the Reigate Chamber of Commerce.

Mr. F. Bordessa, of the technical staff of the British Insulated and Helsby Cables, Ltd., who is leaving for British Columbia, has been presented by his colleagues with a dressing case.

Mr. Louis Duncan, consulting engineer, has removed from 55, Liberty Street, to 50, Church Street, New York, and has associated himself with Messrs. S. Marsh Young and H. A. Pressey, under the firm of Duncan, Young & Pressey, Inc.

Mr. Pakenham W. Beatty has resigned his position as manager of the River Plate Electricity Co.'s lighting undertaking and of the Electrica del Norte lighting and tramway undertaking in Tucuman, Argentine, having been appointed chief engineer of the Compania de Tramways Lacroze de Buenos Aires, Limitada. It may be remembered that the River Plate Co. (whose doings are reported in our "City Notes" to-day) and the Eléctrica del Norte in Tucuman, amalgamated with the object of being in a stronger position to meet the competition of the recently inaugurated Hydro-Electric Co., of Tucuman.

Mr. Ernest A. Hill has resigned his position of advertising manager to the Foster Engineering Co., Ltd., and has commenced business at 24, Stanton Road, Wimbledon, as an advertisement writer and agent.

Obituary.—We desire to express our deep sympathy with Mr. L. M. Waterhouse, managing director of Messrs. Simplex Conduits, Ltd., on the death of his wife, which occurred last week.

CITY NOTES.

Hong Kong Tramway Co., Ltd.

The directors' report states that the accounts for the year to December 31st show a profit of £19,302, plus £3,918 brought forward, making £23,220. Of this the interim dividend paid upon November 23rd absorbed £2,031, and the board have allocated to the reserve for depreciation and renewals £10,000. The *Financier* states that the board now recommend the payment of a final dividend for the six months at the rate of 10 per cent. per annum, free of income-tax, making 7½ per cent. for the year, and that £7,127 be carried forward. In spite of the boycott (to which reference is made later) there was a considerable increase in the traffic receipts during the year, but the result is affected to a considerable extent by the favourable rate of exchange. In the directors' report on the year 1910 reference was made to the charge of an additional cent for every five-cent fare paid in Chinese copper coins, in consequence of the loss which was being sustained on subsidiary coinage. On July 1st, 1912, such action was followed up by refusing to accept copper coinage at all, the Government having brought in an ordinance prohibiting its circulation. No trouble whatever was experienced by the company in connection with this action. The shareholders were informed by circular dated January 21st, 1913, as to the further action taken in November last against Chinese subsidiary silver coin, which unfortunately resulted in the boycott of the cars, estimated by the manager to have been in full force from November 23rd, 1912, to January 21st, 1913. The boycott, which was considerably influenced by political action, was but slowly suppressed. It is impossible to say to what extent the company is still feeling the after-effects, but the board are advised that the receipts are now being affected to a small extent only by that cause. The company's action in the matter was initiated by the Hong Kong Government, and during the period in which the boycott was in full force the Government strongly supported the company. It is difficult to gauge accurately the extent of the loss of receipts, but it is considerable, and representations have been made to the Government for compensation additional to the $30,000 already agreed by them. It is hoped that such representations will result in the payment of satisfactory compensation.

Rangoon Electric Tramway and Supply Co., Ltd.

Mr. Frank Tobin (chairman) presided on May 7th at the annual meeting held at the offices, 3, Great Winchester Street, E.C.

In moving the adoption of the report (see Electrical Review, page 774), the Chairman said the accounts were most satisfactory, and during the year there had been a healthy expansion and growth in every single department of the business. This was the more gratifying, because in 1911, owing to the economic disturbance and bad state of trade in Rangoon, there was a certain check to their prosperity. The profits for that year were larger than they had previously been, but at the same time there was a diminution in traffic takings, and generally the growth and expansion stopped. They began to emerge from that state of depression in the early months of 1912, and since then there had been a pleasing increase of revenue not only from the tramway, but also from the light and power services. In following and judging the monthly traffic returns, they must remember that the tramway was practically working with the same capital as was expended on it five years ago, and the increases shown were increases on the same amount of working capital. This was not, however, quite the case with regard to the light and power. They were constantly extending their business, and expending new capital on mains and equipment, and on connecting up new sources of revenue, so that the increased income which they derived from these two services, was what they should naturally expect in any case, owing to the larger amount of capital which was being employed, and which was becoming from month to month productive. In 1912 their revenue from all sources had been £110,000, as compared with £99,300 in 1911, and as they had been able to keep their working expenses again within 50 per cent. of their takings, the net result had been a profit of £56,793, as compared with £50,700. During 1912 they had expended £15,000 on capital accounts, of which only £1,000 was used on the tramway, mainly for new cars, while over £7,000 was spent on laying down new mains, and over £5,000 on substations and their equipment, and on buildings. The laying of mains meant that they had business in sight, and the capital employed very quickly became productive. The demand for the supply of light and power was a constantly increasing one, and the demand would continue without doubt from year to year, and as a consequence fresh capital outlay would be required. They were in Rangoon to supply the service of the city, and would extend their connection wherever it was required, so long as they could satisfy themselves that the capital expended would bring in adequate and proper profit to the company. For several months they had been studying recommendations for extensions in Rangoon which were absolutely necessary, and which they were satisfied would bring in a proper profit for the company. The outlay they had in sight would amount altogether to about £10,000. They had unissued about £28,000 4½ per cent. debenture stock, and also about 70,000 ordinary shares available for issue. For some years they went without a dividend on those shares, but now they were paying 5 per cent., and without venturing to prophesy as to the future, they felt satisfied that the outlook for those shares was so good that they ought not to sacrifice them at a low price. Hence, to meet their capital expenditure they had come to the conclusion that it would be best to issue 5 per cent. terminable debentures, which would be wiped out in the course of time.

Mr. J. Halliday seconded the motion, and the report was adopted.

On the motion of the Chairman, a dividend of 5 per cent. was declared on the ordinary shares.

Neuhausen Aluminium Co.—The dividend proposed by the Aluminium Industry Co., of Neuhausen, is at the rate of 20 per cent. for 1912, this comparing with 14 per cent. in the previous year, on a nominal share capital of £1,040,000, of which 50 per cent. is paid up. In addition, the reserve fund, which exceeded £82,000 at the end of 1911, is to be raised to the statutory amount of £104,000. It has been suggested at different times that as the shares are only partly paid a fund should be formed out of the profits in order to gradually provide for the payment of the shares in full. The directors have again had this question under consideration, and now propose to make a beginning by making an allocation of £24,000 to the share payment fund. It is calculated that the fund will reach 10 per cent. of the share capital by the end of 1914.

Continental.—France.—A new company has just been formed in Paris (90, Boulevard de Menilmontant), with a capital of £3,000 and the title La Société du Dynamo Fareloc.

The balance-sheet of La Compagnie Continentale Edison, of Paris, for the last financial year, shows a net profit of £146,348, as compared with £154,420 in the preceding 12 months.

La Compagnie Française pour l'Exploitation des Procédés Thomson-Houston, of Paris, reports a net profit of £171,978 for the last financial year.

La Société Française des Cables Electriques, système Berthoud, Borel & Co., of Lyons, reports a net profit of £10,788 for the last financial year.

Belgium.—La Société des Constructions Electriques de Charleroi reports a net profit of £38,338 for the last financial year.

La Société Belge pour la Fabrication des Cables et Fils Electriques, of Brussels, reports a net profit of £9,294 for the last financial year, out of which a dividend of 7 per cent. is being declared.

Germany. — The Berlin-Hagen Accumulatoren-fabrik Gesellschaft is declaring a dividend of 25 per cent. for the last financial year.

The Felten und Guilleaume Carlswerk Gesellschaft, of Mulheim, is declaring a dividend of 8 per cent. for the last financial year, as compared with only 6 per cent. for the preceding 12 months.

Russia.—La Société Russe d'Electricité A.E.G., of St. Petersburg, is declaring a dividend of 9 per cent. for the last financial year, as compared with only 8 per cent. for the preceding 12 months.

Holland.—The report of the Philips Glowlamp Works, of Eindhoven, the manufacturers of the Philips incandescent lamps, shows a profit of £81,120, out of which a dividend at the rate of 10 per cent. per annum is being declared.

(*Continued on page* 817.)

rge from
since then
from the
following
mber that
capital as
own were
was not,
d power.
ding new
w sources
ived from
ct in any
being em-
nth pro-
had been
as they
es again
ad been a
1912 they
ly £1,000
er £7,000
00 on sub-
laying of
he capital
d for the
e, and the
ar, and as
They were
ld extend
hey could
bring in
al months
s in Ran-
were satis-
he outlay
£10,000.
stock, and
For some
now they
esy as to
ese shares
low price.
me to the
erminable
ne.
eport was

cent. was

proposed
he rate of
n the pre-
which 50
n exceeded
ry amount
hat as the
out of the
the shares
nder con-
making an
calculated
tal by the

just been
capital of

Edison, of
146,348, as

Procédés
71,978 for

Berthoud,
r the last

Charleroi

Electriques,
t financial
ared.
vik Gesell-
t financial

Mulheim,
al year, as
ths.
St. Peters-
t financial
eceding 12

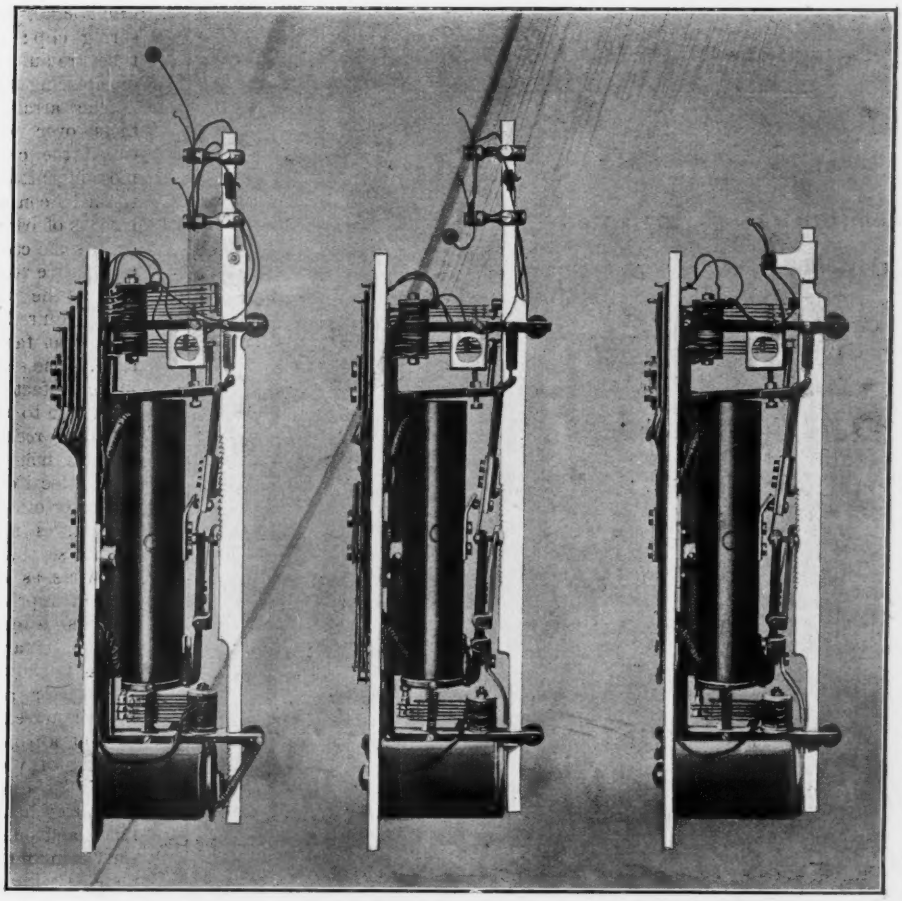
Works, of
ent lamps,
the rate of

THE BETULANDER AUTOMATIC TELEPHONE SYSTEM.

In telephony, as in other branches of electrical engineering, finality is never attained. It is not a matter for surprise, therefore, that a new automatic telephone system, possessing novel and interesting features, should have been introduced, and we have pleasure in placing a description of it before our readers. Strange as it may seem, in connection with so complex a problem as the substitution of a machine for a human operator, the most marked characteristic of the Betulander system is its comparative simplicity. It may be called the "straight-line" system of automatic telephony, for practically all its operations take place in straight vertical lines; the principle by which the number wanted is arrived at is that of successive selection, and the process may be carried on absolutely without limit, so far as the mechanism is concerned, the number of subscribers connected to an exchange being limited only by other considerations.

Fig. 1.—Subscriber's Telephone and Actuator.

Briefly, the subscriber sets a number of levers on his instrument to the digits representing the number wanted; he then lifts the telephone, and by this movement a set of impulse senders is allowed to come into operation, one after another, transmitting to the exchange consecutive groups of impulses, beginning with the set corresponding with the highest power of 10. During this operation the levers return to their zero positions in the same order, so that the subscriber can, so to speak, see his call being sent to the exchange by the instrument, which in this process is entirely automatic. It will be noticed that the number is completely set before any impulses are sent out; an error in setting any one of the levers, therefore, can be corrected at any time before lifting the telephone, without necessitating a fresh start, and without calling up a wrong number. The rate at which the impulses are sent is also independent of the subscriber, being controlled by a centrifugal governor. The moment the last impulse has gone, the subscriber either is through to the called subscriber, and can hear the bell ringing with the aid of his receiver, or is receiving the "busy-back" signal from the exchange. We give in fig. 1 a view of the subscriber's instrument, with cover removed, so as to show the impulse senders separately, the governor being visible on the right-hand side of the latter. This instrument is suitable for a 100-line exchange, but by adding more levers it can be adapted for anything up to a 100,000-line exchange. These levers can be added to existing instruments with but slight modification.



A. B. C.

Fig. 2.—Pre-Selector, Units Selector and Group Selector.

Passing on to the exchange, there are here provided four

relays for each subscriber, no matter how large the system may be. Three of these relays receive the impulses from the subscriber's instrument (which is called the "actuator"), when he originates a call, and the fourth is used when he is called, connecting the ringing current to his line. Condensers are also provided, and these, with the relays, perform the usual functions in a central-battery system. The sets of relays and condensers are assembled together in blocks of 10, serving 10 subscribers, and no extra sets are needed; additions can be made at any time, as the number of subscribers increases.

For finding the wanted number, a series of "selectors" is provided. These devices are extremely interesting; they are all very much alike, the principal parts being identical, and they all move in a vertical plane only. On large systems three patterns are used, which are illustrated in fig. 2. The selector consists of three electromagnets, two of which are assembled in a common sheath, but have separate magnetic circuits; each of these is connected to a line wire, and receives the impulses sent out by the actuator, through the subscriber's line relays. These magnets operate and release the selector by an ingenious arrangement of pawls working against a ratchet. The function of the third electromagnet will be explained later. The selectors are mounted in an iron frame in groups of ten, but each can be taken out and replaced by a spare one in a moment by any person of ordinary intelligence, being held in position by a spring clip; all the necessary connections are automatically made in the act of replacing the selector.

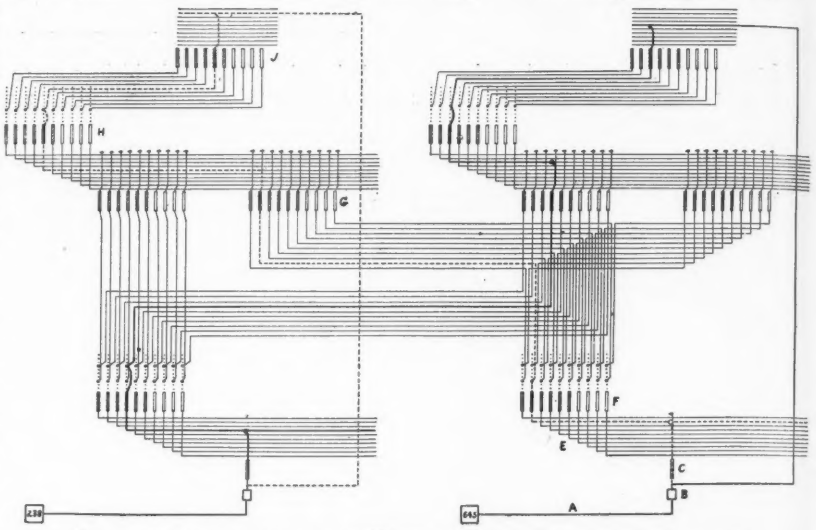


FIG. 3.—DIAGRAM SHOWING THE METHOD OF CALLING SUBSCRIBERS ON THE BETULANDER SYSTEM.

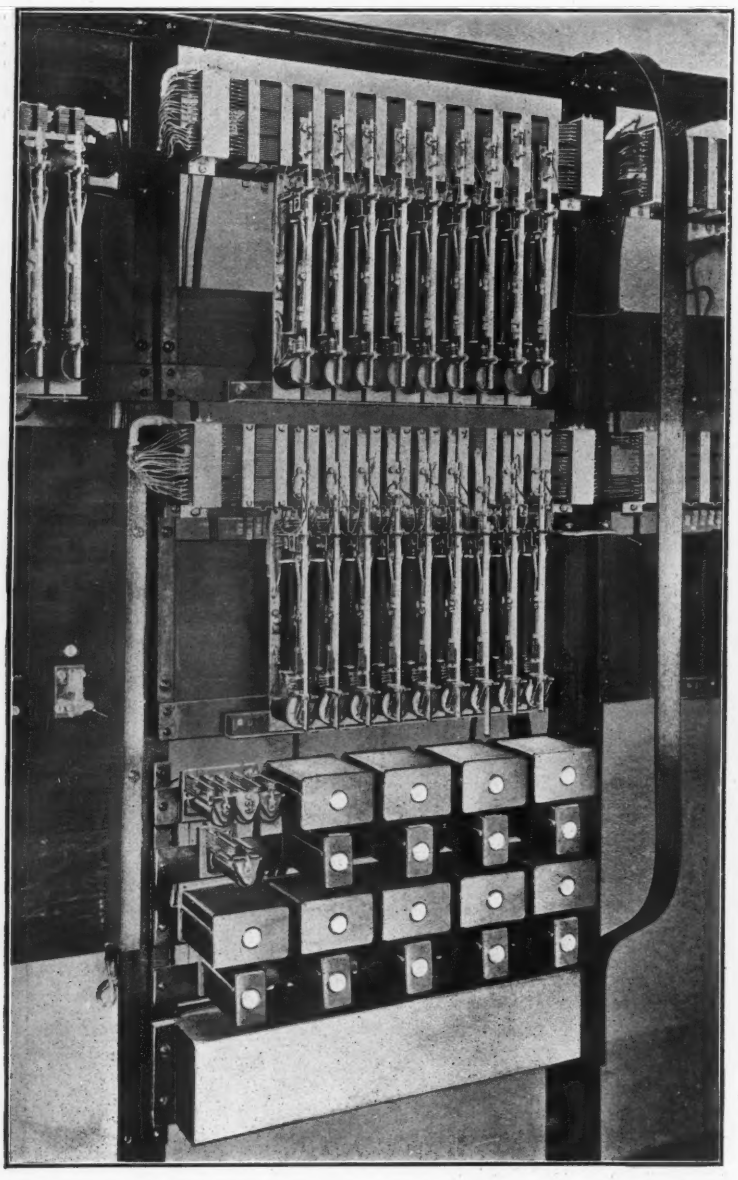


FIG. 4.—PANEL OF SELECTORS.

The arrangement of the fixed contacts over which the selector works, called the contact field, is one of the most ingenious features of the apparatus, the field consisting simply of continuous lengths of bare wire, suitably supported, or in some cases metal segments. It will at once be seen that this device greatly reduces the number of soldered connections required, and is so simple and accessible that faults are practically impossible. The selector carries wipers, which make contact with these wires, stepping from wire to wire in accordance with the impulses received. The third electromagnet mentioned above is operated from a local circuit through the contacts of one or other of the first two magnets, and serves mainly to tilt the selector frame, so that the wipers do not touch the wires as they pass over them until the appropriate wire in the contact field is reached, thus preventing unnecessary wear and ensuring secrecy. In fig. 4 is shown a panel, from which a pre-selector and a units selector have been removed, while fig. 5 illustrates part of a panel of group selectors. In the case of very small systems, the contact fields can be arranged so that the central exchange is reduced to one set of relays and one selector per subscriber, as shown in fig. 6, representing a complete switchboard for 10 stations.

We have mentioned that there are three types of selector; the first is the "pre-selector" (fig. 2A), with which each subscriber's circuit is provided. The moment the subscriber's telephone is lifted the pre-selector automatically selects the first

disengaged junction leading to a "group selector"—dropping down instantly to the idle line and stopping there. Normally there are 10 junction lines per 100 subscribers, represented by 10 wires in the contact field of the "pre-selector," and any number of these junctions can be equipped with group selectors, according to the requirements of the service. It is considered that 10 per cent. provides an ample margin, 6 or 7 being usually sufficient. The subscriber's actuator and relays are thus extended through the pre-selector to a group selector (fig. 2C), which receives the first series of impulses sent out by the actuator—the pre-selector having been automatically locked in position and disconnected, so that it is not affected by subsequent impulses.

To each group selector there is allotted an auxiliary selector (fig. 2A) in each of the 10 following groups, the function of which is to find an idle junction and selector in the next group; the last-named selector receives the second series of impulses sent out from the actuator, and picks out the corresponding group, and the same sequence of operations continues until the final or units selector (fig. 2B) has found the line wanted, when, if the line is free, the signalling relay is actuated and the ringing current is sent on the line of the called subscriber, until the latter replies, or the caller (who can hear the ringing) replaces his telephone on the rest.

If the line, however, is engaged, the units selector, directly it reaches this line, instantly returns to normal, causing all the selectors in the series also to return to the normal position, and the subscriber receives the "busy" signal. When either of the telephones is placed on its rest, the whole of the selectors used in the connection are immediately restored to normal.

In order to make clear the operations described above, we show in fig. 3 the apparatus which would be employed in establishing communication between two subscribers in a system designed for 1,000 lines, but, for the sake of clearness, only 200 lines are shown on the diagram. The maximum traffic is here assumed to require 10 per cent. junction lines or "trunking," but the six selectors shown hatched would usually suffice. In the figure, two subscribers' instruments are represented by Nos. 238 and 645, and it is assumed that the latter, after setting the levers on his actuator to the figures 2, 3 and 8, lifts his telephone from the switch hook. An impulse is then transmitted over the line A to the relay set B belonging to the calling subscriber, which in turn operates his pre-selector C. This instantly selects the first idle line of the group of trunk lines E assigned to the group of subscribers to which No. 645 belongs—in this case, assumed to be the second—and puts the connection through, therefore, to the second in the hundreds group of selectors F, which receives the first series of impulses from the actuator and steps up to the third position, representing the third hundred (200—299). This extends the connection to the group of auxiliary hundreds selectors at G, to which all subscribers between the numbers 600 and 699 have access when calling for any number between 200 and 299. The auxiliary selector instantly finds an idle trunk—say the fifth—leading to a tens selector in the group H, which receives the second series of impulses sent out by the actuator, and steps up to the fourth position (controlling the numbers 30-39). The connection is now extended to a units selector — the fifth in the group J—which is operated by the last set of impulses, and steps up to the wanted subscriber's line. The complete path of the connection is shown by a dotted line, and similarly the course of a call for No. 645, originated by No. 238, is shown by a heavy line.

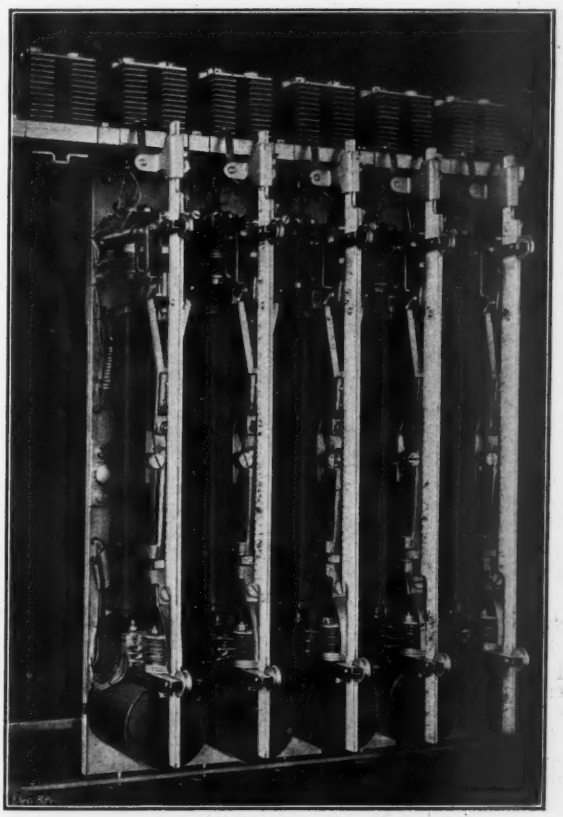


Fig. 5.—Part of a Panel of Group Selectors.

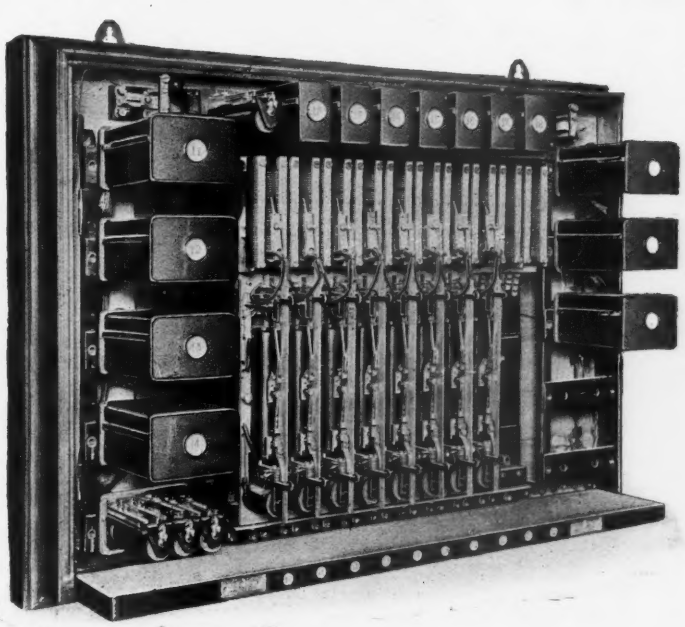
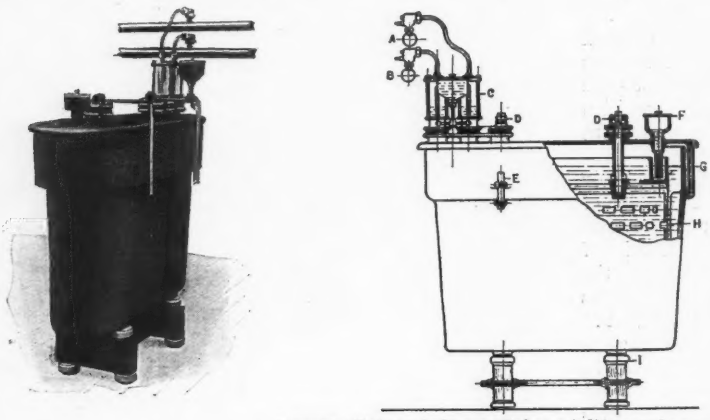


Fig. 6.—Complete Betulander Automatic Switchboard for 10 Stations.

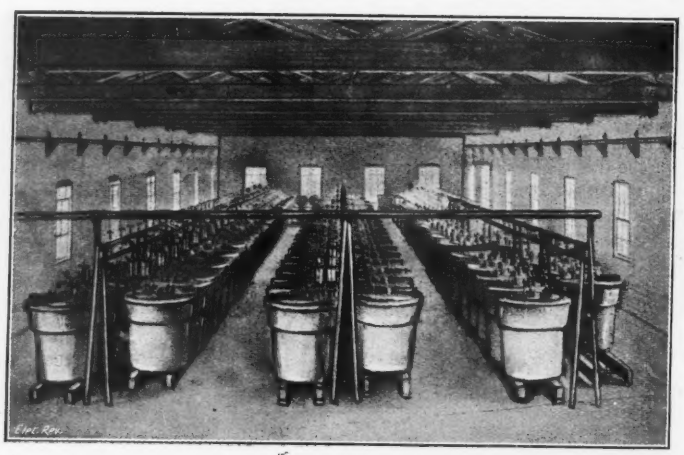
Summarising the leading features of the system, it is claimed that its simplicity and flexibility allow the equipment to be provided in exact agreement with the actual number of subscribers' lines; the apparatus is readily accessible at all times, and in every part, without interfering with the working, and it can be extended indefinitely without modification of the general design; as the actuator is completely set up before any

impulses are sent to line, delays on the part of the calling subscriber do not affect the exchange, and therefore the selectors are engaged for the minimum time; they are also instantly released on the conclusion of a conversation, or if the line is found to be busy, thus setting free the junctions and enabling an unusually low percentage of trunking to be employed, rarely exceeding 6 or 7 per cent. The energy consumed is small, and the ringing device only runs whilst ringing, being self-starting. Skilled attendance is not necessary, as any of the selectors can be exchanged for spare ones with ease, and the arrangement of the contact fields reduces cabling and faults to the minimum.



A, oxygen offtake; B, hydrogen offtake; C, indicator and pressure equaliser; D, positive electrode terminals; E, negative electrode terminals; F, filling cup; G, hydraulic joint; H, diaphragm; I, insulating supports.

I.O.C. Oxygen-Hydrogen Generator.



I.O.C. Generators Installed at the Works of the International Oxygen Co.

An exchange on the Betulander system for 100 lines has been installed at Marconi House, Strand, London, where it will be used to control the local circuits; for this purpose it will be increased to a capacity of 200 lines. The simplicity of the apparatus, and the small space occupied, are striking features of this board. We understand that the Marconi's Wireless Telegraph Co., Ltd., has acquired the patents for every country except Sweden, where the system originated, and has appointed Mr. C. B. Clay, formerly Metropolitan Superintendent to the National Telephone Co., as manager of the department. Every effort is being made to expedite the manufacture of the apparatus, and we have no doubt that a good deal will be heard of the system in the near future. An exchange controlling 1,000 stations, installed at No. 38, Rue de Pelletier, will be open for inspection during the visit of the I.E.E. to Paris next week.

We are indebted to Mr. Clay and his assistant, Mr. Ward, for facilities to inspect the installation and to prepare this brief description of the system.

THE COMMERCIAL PRODUCTION OF OXYGEN AND HYDROGEN.

The commercial uses of both oxygen and hydrogen have extended enormously during the last few years, particularly in connection with engineering work, for the purpose of cutting steel and iron by means of the oxy-hydrogen and oxy-acetylene flames and for autogenous welding.

For such purposes as these purity of the gas is essential, as the presence of even small percentages of inert gases, such as nitrogen or chlorine, greatly reduces the efficiency of the operation.

Many firms could with obvious advantage produce oxygen and hydrogen on their own premises, given suitable apparatus, and effect a saving over the usual procedure of purchasing such gases in cylinders.

Apparatus for this purpose, constructed by the International Oxygen Co., Newark, N.J., has been adopted in some of the largest works in America, notably by the General Electric and Westinghouse Companies, the Edison Battery Co., and in the Brooklyn Navy Yard. The company has placed on the market simple equipments of various capacities suited to the industrial needs of manufacturers; these consist of a series of electrolytic cells, each generating 7 cb. ft. of hydrogen and 3½ cb. ft. of oxygen per KW.-hour. Each cell requires 300 to 400 amperes at 2 volts.

An Installation of Oval Type I.O.C. Generators.

The construction of the I.O.C. cell is shown diagrammatically in one of our views; an outer iron tank serves as the negative electrode and a perforated inner iron tank, suspended from the cover, as the positive electrode.

An asbestos sack or diaphragm suspended from an hydraulic joint or water seal, encloses the inner electrode, dividing the cell into two compartments, so that the oxygen generated on the walls of the inner tank is kept separated from the hydrogen formed on the walls of the outer one.

As a further check against mixture of the gases the asbestos sack, when impregnated with alkali solution, forms an effective barrier between the two gases.

A solution of caustic potash and water forms the electrolyte; this is introduced into the hydraulic joint through a filling cup, and distributed in the two compartments, the joint automatically regulating the working of the cell.

The oxygen and hydrogen in passing from their respective compartments to the gas mains pass through indicators and pressure equalisers; the latter indicate at a glance how the cell is working, and equalise the gas pressure in each compartment, also they protect the cell from the effect of excessive pressure in the discharge mains, and should the latter become clogged, allow the gases generated in the cell to escape into the atmosphere.

The makers claim that the I.O.C. apparatus will produce pure gases—99·5 per cent. in the case of the hydrogen and 98·5 per cent. or more for oxygen—without other manipulation than the addition of distilled water daily to make up for the liquid decomposed.

As an example of the saving in cost obtained by the apparatus, we gather that in the case of a works using 1,000 cb. ft. of oxygen daily, the I.O.C. plant would supply this for $6 per day, taking energy at ½d. per unit, while the chlorate of potash method, or cylinder oxygen, would figure out at $25 per day.

In the case of large installations, such as the company's own plant at Newark, N.J., the cells arranged in rows, are connected to gas-holders, the contents of which may be drawn off, metered and compressed for bottling if required.

Our views show the latest oval pattern cell turned out by the company, which has placed its English business in the hands of Messrs. Arthur Lyon & Co.

NEW COMPANIES REGISTERED.

British Sherardisers, Ltd. (128,789).—This company was registered on May 5th, with a capital of £10,000 in £1 shares, to acquire any interest in the process known as "Sherardising" or any process for covering iron, steel or other metals with a coating of zinc or other metallic substances, &c., and to adopt an agreement with H. M. Delacour, as receiver and manager of United Sherardising, Ltd. The subscribers (with one share each) are:—H. M. Delacour, 58, Norbury Crescent, Norbury, S.W., mechanical engineer: W. J. Halsey, 23, Queen Anne's Gate, S.W., solicitor. Private company. The number of directors is not to be less than two or more than five; the first are W. J. Halsey and H. M. Delacour; qualification, one share; remuneration (except general manager), £100 each per annum. Registered office, Hythe Road, Willesden Junction, N.W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Charing Cross, West End and City Electricity Supply Co., Ltd. (29,122).—Capital, £2,100,000 in £5 shares (130,000 pref., 130,000 ord., 80,000 cum. pref. and 80,000 cum. ord.); return dated March 18th, 1913; 80,000 pref., 80,000 ord., 80,000 cum. pref. and 70,000 cum. ord. shares taken up; £5 per share called up on 80,000 pref., 80,000 ord. and 80,000 cum. pref.; £1,200,000 paid: £350,000 considered as paid on 70,000 cum. ord. Mortgages and charges: £1,087,178.

Clarke, Chapman & Co., Ltd. (39,045).—Capital, £200,000 in £10 shares (7,000 pref.); return dated March 14th, 1913; 12,736 ord. and 6,985 pref. shares taken up; £10 per share called up on 3,536 ord., £2 10s. on 200 ord. and £10 on 4,485 pref.; £80,210 paid; £90,000 considered as paid on 9,000 ord., £25,500 on 2,550 pref. and £1,500 on 200 ord. Mortgages and charges: £100,000.

Cunningham, Ltd.—Particulars of £1,000 debentures, created April 22nd, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Javal Patents, Ltd.—Particulars of £1,000 debentures, created April 9th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £200. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Lancashire United Tramways, Ltd. (87,044).—Capital £200,000 in £1 shares. Return dated March 13th, 1913. 192,878 shares taken up. £7 paid. £192,871 considered as paid. Mortgages and charges outstanding, £566,500. Deferred debenture stock issued, having no charge over the assets of the company, £83,330. Note: Deb. stock to the nominal amount o £20,000 included in the above £566,500 is issued as security for advances up to £15,000.

Ferranti, Ltd.—A memorandum of satisfaction in full on December 31st, 1912, of trust deed dated June 18th, 1907, securing £20,000, ha been filed.

Kensington and Knightsbridge Electric Lighting Co., Ltd. (26,193).—Capital £350,000, in 50,000 ord., 10,000 first pref. and 10,000 second pref. shares of £5 each. Return dated March 13th, 1913: 21,000 ord., 10,000 first and 10,000 second pref. shares taken up; £5 per share called up on 15,968 ord., 10,000 first pref. and 10,000 second pref.; £179,840 paid; £25,160 considered as paid on 5,032 ord. Mortgages and charges: £115,000 in respect of debenture stock issued by this company in conjunction with Notting Hill Electric Co. Ltd., £227,500.

Newmarket Electric Light Co., Ltd. (44,450).—Capital £30,000 in £10 shares. Return dated March 31st 1913; 2,656 shares taken up £26,560 paid. Mortgages and charges: £14,200.

New System Private Telephone Co., Ltd. (73,732).—Capital £10,000 in £1 shares. Return dated March 24th, 1913; all shares taken up £8,000 paid; £2,000 considered as paid. Mortgages and charges: £2,000.

Egham and Staines Electricity Co., Ltd.—Issue on April 30th, 1913, of £100 debentures, part of a series of which particulars have already been filed.

Veritys, Ltd.—Mortgage dated April 28th, 1913, to secure £800, charged on freehold land and premises at Nechells, Birmingham, &c. Holders: J. N. Brown, C. F. Brown and A. J. Williams.

Also mortgage dated April 29th, 1913, to secure £800, charged on same property. Holder: Annie M. Gowan.

Tyer & Co., Ltd.—Charge on freehold property in Metcalf Street, East Nelson Street, and land adjoining, all in Carlisle, dated April 14th, 1913, to secure all moneys due from the company to London, County and Westminster Bank, Ltd., 41, Lothbury, E.C. The charge is given by the company to the bank as collateral security for an overdraft not to exceed £7,000, which is already secured by debentures for that amount, registered March 11th, 1913.

CITY NOTES.

(*Continued from page* 812.)

Elmore's German and Austro-Hungarian Metal Co., Ltd.

THE directors' report for the year ending December 31st, 1912, says that the accounts, beyond the increase of the amount standing to the debit of profit and loss account, show but little alteration. On the debit side there is a small decrease, £7,729, as against £8,021 in 1911. The receipts were greater by £872 than the actual expenditure, but including debenture interest, the net loss is £5,195, such loss being due to the non-receipt of dividends from the "Metall" Co. The loan account with the Metall Co. is increased by £764, and now stands at £45,144.

The accounts of the Metall Co. show a considerable improvement, the gross profit being larger by M. 109,073 than in 1911, and after making full allowance for depreciation, the net result of the year's working is a profit of M. 1,639, as against a loss in 1911 of M. 67,992. The improvement is due partly to decreased cost of production, and partly to the increased prices obtained during the last three months of the year, owing to the re-constitution of the Copper Tube Syndicate in Germany. The weight of finished goods sold was somewhat greater than in the previous year. The cessation of the price war will, it is believed, result in a steady improvement in the earning capacity of the company, and there has been a considerable increase in the selling price obtained for the company's goods. Apart from the low selling prices obtained during the year, syndicate expenses amounted to M. 26,333, a charge which it is anticipated will not be incurred again. In addition to the decrease in the cost of production, general expenses are less by M. 13,557 than in 1911. Interest, however, shows an increase of M. 12,694. This is partly due to the high price of copper which ruled during the year, and partly to the high Bank rate. The amount due to Messrs. Sal Oppenheim, Junr. & Co. has been reduced by M. 91,643, and sundry creditors by M. 22,512, while the total value of copper, stores and book debts show an increase in value of M. 220,313. As against this, however, bills payable show an increase of M. 275,599. The directors are unable to report any substantial progress in connection with the Mertens process, but the sales of rollers during the first three months of the present year were considerably more than for the same period last year.

MR. JOHN MACFARLAN presided on May 5th, at the offices, Finsbury House, E.C., over the annual meeting. He said that the directors were sorry that the results of the year's work were so small. They had, however, some satisfaction in knowing that the causes which prevented a more successful result were causes over which they had no control, and which were not in any way due to the failure of the company to produce good work, or a sufficient quantity. Taking the lowest price obtained in any year previous to the dissolution of the old syndicate, compared with the prices obtained during the last four years, they found that the price war had caused a loss of profit of M. 1,383,539, or say £69,000. This was no exaggeration, and it was very disappointing to the directors, because at that time they had completed the large extensions which were deemed necessary, and were in a position to produce larger quantities at a reduced cost, and then, when it was hoped that the benefits arising from such extensions would mature, the price war commenced. He desired to draw the attention of both the debenture-holders and shareholders to the inherent financial stability and strength of the company, which enabled it to experience such a large loss of profit and at the same time increase its sales from, say 1,360 tons in 1908 to 1,935 tons in 1912, and to

expend over £20,000 on additions to land, buildings, plant, &c., during the same period. A new syndicate was formed on August 1st last, but at that time they had in hand a large number of contracts and orders to execute, so that it was not until quite late in the year that they began to reap the benefit of increased prices. Their expenditure upon additions to land, buildings and plant last year represented a comparatively small sum, less than the amount written off by way of depreciation, viz., £3,100. Notwithstanding this small expenditure, their sales for the 17 weeks of the present year showed an increase of more than 10 per cent. over those for the same period last year at considerably better prices. They had an abundance of work on hand. It was a source of great regret that the profit made by the Metall Co. last year was not sufficient to permit that company to declare a dividend, so that the interest due on January 1st last to the debenture-holders of the Austrian Co. could be paid, but with the improved condition of matters, it was only reasonable to believe that dividends would be forthcoming in the future. With regard to the Mertens process, some progress had been made, and they were selling an increased quantity of rollers, but nothing like the amount they should be selling. The business was a very important one for the Metall Co., and Mr. Preschlin, their works' manager, was doing his best to bring about a complete understanding amongst the parties interested. The directors had just returned from a visit to the works at Schladern, which they found to be in excellent order. They saw two new improvements in the manufacture, which promised to give valuable results in the near future in the direction of further reducing the cost of production.

Mr. J. Heal seconded the motion.

Mr. Barkworth criticised the figure taken as the value of the patents, and also that taken as the holding in the Metall Co., and said it seemed to him that they had lost the whole of their share capital in the Austrian Co. In view of that would it not be well to wipe out these items and write the capital down accordingly?

The Chairman said they had some very valuable patents in connection with Mertens process. They had patents in 22 countries. Times were hard, and they could not deal with their holding in the Austrian Co. now. They would have to wait for more favourable times for that.

The report was adopted, and the retiring director was elected.

The Chairman said he thought they could look forward to better times now, as in every way things were looking up. They were not so hampered for want of cash. The members of the board held 23,000 debentures as well as their preference and ordinary shares, and he thought they could see their way to pay some interest next July.

Potteries Electric Traction Co., Ltd.

The directors report that the capital expenditure during 1912 was £2,559. The total receipts amounted to £117,101. The traffic receipts, £100,646, showed a decrease of £506, as compared with the previous year, due to the unrest in industrial circles during the early part of the year. After deducting all expenses chargeable to revenue, including £11,524 for debenture and other interest, there remains a balance of £35,189, as compared with £35,100 for 1911. Adding the balance of £681 brought forward, there is a balance available for distribution of £35,870, which the directors recommend should be applied as follows:—Depreciation—reserve account, £2,000; renewals account, £12,500; dividend 5 per cent. per annum on the preference shares, £12,250; dividend 3½ per cent. per annum on the ordinary shares, £8,575; carry forward, £545. The depreciation and reserve account will then stand at £21,000, and there will be a credit balance on the renewals account of £13,869. During the year £17,486, as compared with £18,040 in 1911, has been expended on the improvement, renewal and repair of the permanent way.

The annual meeting will be held on May 19th.

	1911.	1912.
Miles open—Route miles	31·68	31·68
Number of passengers carried	19,819,097	19,575,558
Average receipts per passenger	1·29d.	1·23d.
Average working expenditure per passenger	·71d.	·71d.
Proportion of expenses to receipts	58 %	57 %
Number of cars	110	110

Calcutta Electric Supply Corporation, Ltd.

The directors' report for the year 1912 states that 12,043,398 units were sold, compared with 10,566,038 units in 1911. The number of consumers connected at December 31st last was 7,030, compared with 6,383 in 1911, an increase of 647, and the equivalent connections in 33-watt lamps show an increase of 92,726. The results for the past four years are as follows:—

Year.	Consumers.	Equiv. connections in 33-watt lamps.	Units sold.	Gross revenue.	Net revenue.
1909	5,078	452,272	7,856 383	£127.576	£67,024
1910	5,695	528,988	8,940,005	£137,998	£85,597
1911	6,383	616,721	10,566.038	£151.905	£95,597
1912	7,030	709,447	12,043,398	£173,907	£110,168

Exchange is calculated at 1s. 4d. per Rupee.

The profits for 1912 amount to £110,169, which, with the balance brought forward from 1911, and interest received on money at deposit, makes a total of £114,989. The directors have invested an additional £10,053 on account of the reserve fund, increasing the investments to £50,561. Some of the investments, in common with many gilt-edged securities, have depreciated in value, and the board have accordingly written off £1,500 from the cost price. After deducting the interim dividend at the rate of 7 per cent. per annum paid on the ordinary shares in November, 1912; the dividends paid and accrued on the preference shares; the £1,500 for depreciation of securities, and the other items set out in the net revenue account, there remains an available balance of £68,903. The directors recommend that £35,000 be placed to the credit of the depreciation and renewals account; that £5,000 be added to the reserve fund, and that a final dividend be paid on the ordinary shares for the second half-year, at the rate of 10 per cent. per annum, making 8½ per cent. for the year, which will leave £2,862 to be carried forward after providing for the directors' extra remuneration of £2,500. The reserve for depreciation and renewals will thus be increased to £114.311, and the reserve fund, with the addition of £1,988 from dividends on investments, &c., will stand at £91,088. The high-tension station at Cossipore was opened in July last, and is now practically complete. The amount expended up to December 31st last has been divided up under the proper headings in the capital account. The demand in Calcutta for electrical energy continues steadily increasing, and the result of the working for 1912 must be considered satisfactory. The directors regret to report the retirement, on April 30th of this year, of the agent and manager, Mr. F. Rawson, C.M.G., who has efficiently occupied that position since January, 1908. Mr. R. E. Winkfield, chief engineer, has been appointed agent and chief engineer. Major-General Mahon, one of the directors, has visited Calcutta, and furnished the board with a valuable report upon the working of the company.

Units generated, in kw.-hours	15,369,028
Units sold—Public lamps	7,425
By special contract	726,807
By meter for lighting	3 681,311
By meter for power	7,627,855
Total sold	12,043,398
Used on works	1,399,265
Not accounted for	1,926,365
Accounted for	13,442,663
Max. supply demanded, kw.	5,530

River Plate Electricity Co., Ltd.

This company held its annual meeting on Monday, May 5th.

The report for the year ended December, 1912, showed continued progress. The net revenue, after providing for administration expenses, bad debts and all necessary depreciations, amounted to £51,176, plus £7,659 brought forward. Deducting interest on 5 per cent. debenture stock, £10.000, there is a surplus of £48,835, out of which a dividend at the rate of 6 per cent. for the year upon the preference stock absorbs £7,500, a dividend of 10 per cent. for the year upon the ordinary stock, £12,000, interest at the rate of 10 per cent. on the instalments upon the new shares absorbs £890, addition to general reserve, £15,000, income-tax reserve, £2,000, further remuneration to directors, £1,029, carry forward, £10,416. With the above-mentioned £15,000 from revenue and £30,000 transferred from premium account hereafter mentioned, the general reserve will stand at £145,000. In addition, £8,450 has been charged against the year's revenue for depreciation of plant, increasing that reserve to £44,872, and bringing, with the carry forward of £10,416, the total reserves of the company to over £200,000. Though there have been delays due to the non-delivery of plant contracted for in this country, good progress is being made with the extensive additions to the new generating station at Ensenada, and it is anticipated that by the early autumn of the present year the new plant will be finished and put into commission. This will enable the generation of light and power to be wholly conducted at Ensenada, from which added efficiency and considerable economies will result. The important work of placing the company's cables and electric connections underground in the leading streets and squares of the city of La Plata has been started, and it will be completed and the company's generating station at La Plata dismantled well ahead of the time stipulated for in the contract with the Government of the province of Buenos Ayres. On their part the Government propose largely to increase the public arc lighting in the central districts of La Plata. The arrangement between the Electrica del Norte and this company for joint working at Tucuman is now in operation. The Hydro-Electric Co. of Tucuman has been running in competition since early in November, and for some time past non-commercial rates of charge for light and power have prevailed. This company and the Electrica del Norte will continue to make competitive rates at Tucuman so long as may be necessary to retain their business.

30,000 new ordinary shares of £1 each were, in May last, issued to the stockholders at a premium of £1 per share. The shares were fully subscribed and in due course allotted. The full premium of £30,000 received has been added to the general reserve. The shares will be converted into ordinary stock immediately. The fourth payment on account of the amortisation of the 5 per cent. obligations of the German Trans-Oceanic Electric Co. (Series 1) held by this company, viz.:—£1,900, was duly made on April 1st, 1912, reducing the amount outstanding to £142,900.

Mr. M. W. Mattinson, K.C., presiding at the meeting at Capel House, 62, New Broad Street, E.C., said that the net profits for the year ending December 31st, 1911, amounted to £47.200, whilst those for the year ending December 31st last amounted to £51,175. During the last nine years their net profits had grown from £20,000 a year to £51,000, whilst, during that time, the addition to their capital liabilities was only £55,000. This satis-

factory position was due to the large amount of undivided profits which had been carried to the reserve fund and applied to the extension of the business. The available profits for the year enabled them, after meeting all prior charges, to recommend, for the fifth year in succession, a dividend of 10 per cent. on the ordinary share capital, to add £15,000 again to the reserve fund, and to carry forward £3,757 more, bringing up the carry forward to £10,416. They had distributed less than their available profits, and their conservative policy in this regard needed no apology. The result of their policy was that they were in a very strong position, and could face the competition in Tucuman with the confident assurance that it was well within their powers to sustain it as long as might be necessary. The chairman proceeded to deal with the items in the profit and loss account, and said the revenue from the La Plata, Ensenada and Tucuman stations had increased by £5,773, which was eminently satisfactory in view of the circumstances of the year, which, apart from the growth of business in La Plata and Ensenada, were not favourable. All the extra profit was made at La Plata and Ensenada, for the competition at Tucuman, although it only commenced in the middle of November, affected the net results of the station for the whole year. The conditions were also unfavourable in respect of the price of coal, which last year cost them a considerable sum, and would also cost them extra this year, although next year he was confident there would be a material alleviation. In addition, during the whole of the year they had the cost of running two stations instead of one, and this would also continue during the greater part of the present year; although here again, barring unforeseen circumstances, it would come to an end in the autumn. There had been a steady growth of business, both at La Plata and Ensenada, which had fully realised their expectations, and in addition the modern turbine plant erected at Ensenada had justified their calculations as to economy of production. Interest from investments was down by £461, which was due to the failure of the La Plata Tramways Co. to pay its preference interest. The cause was well known, being due to defalcations by the company's cashier. The La Plata Tramways Co., however, was a sound concern with excellent prospects, and its earnings were steadily growing, and before long the arrears on the preference shares would be paid, as well as dividends on the ordinary capital, in which they were also interested. Their miscellaneous receipts, outside of the profit of their generating stations were equal to over 80 per cent. of the debenture interest—a proportion likely to be still further improved in the future. Dealing next with the balance-sheet, the Chairman pointed out the considerable increase in the item of stations, which was mainly represented by the expenditure during the year on the large extension at Ensenada; the making of extensions for customers, and the provision of arc lamps for the Government. If they added the items set apart this year, and the amount carried forward, they had total reserves of over £200,000. There was a further considerable reserve in the appreciation of the value of their real estate at La Plata and Ensenada, and he thought he was justified in saying that they were not in an unfavourable position for a company with an ordinary capital of £150,000. As regarded the future, there would be further economy when they shut down the station at La Plata and worked only from Ensenada. The growth of La Plata was justifying the most hopeful prognostications of those who believed in it. Apart from their business in private lighting, they were looking to a material growth in public lighting business and traction and power. The Government of the provinces of Buenos Ayres were adding largely to the public lighting. The two tramway companies they served were also steadily extending, whilst a large number of freezing and other establishments were being promoted at Ensenada, which would require large quantities of power, and at present there were negotiations on the subject. Until the completion of their extensions at Ensenada they could not have attempted large supplies, but when, as would be the case in the autumn, they had established 9,000-KW. turbine plant, they would be able to take on bulk business unthought of a few years ago. It was too early to say what would be arranged, but he was not unhopeful of seeing a considerable amount of business obtained, and, in any case, with their extensions they would be able to serve the industries of Ensenada and La Plata with power on terms as satisfactory as in any other town in the Republic. The chairman next dealt at considerable length with the position of affairs in Tucuman, and pointed out that on the private business they were making a loss. Their competitor, the Hydro-Electric Co., had a big organisation for a business which was comparatively trifling in extent, and obviously they must be making a still greater loss. On the other hand, the arrangement made by their company with the Electrica del Norte was working most satisfactorily and was benefiting both concerns, and they had now also a share in the profits of the Santiago station and in the tramway system of Tucuman, which was also non-competitive. This latter remark might be difficult to reconcile with the statements made in the prospectus issued by the Hydro-Electric Co., in 1912, in which it was stated that that company had a valuable electric tramway concession within the city of Tucuman and suburbs, "a considerable proportion of which was already constructed." He knew nothing one way or the other about the concession; but, as a matter of fact, in April, 1912, there was not a single yard of electric tramways in Tucuman or its suburbs belonging to the Hydro-Electric Co., and even now there were no electric tramways in the city or suburbs which did not belong to the Electrica del Norte. Another interesting factor in the Tucuman problem was that of oil fuel, and in this connection the most interesting development might be imminent. Last year he told them that a Diesel engine would be a much more economical producer of current than a costly hydraulic system situated many miles away transmitting over long distance lines, and with transforming plants at the points of distribution. The difficulty was that oil fuel was not available in Argentina at remunerative prices, but, as they knew, there had been an enormous increase in the output from the Mexican oilfields and the Mexican Co. were arranging for the transport of oil in bulk to Argentine. They were in correspondence with the company on the whole subject, and sooner or later there would be fuel available from that source. He had also read lately that large deposits of oil had been found in the province of Salta, which immediately adjoined Tucuman, and if this was so, the supply would be really a local one. There would be no question of scrapping their steam plant if they got the oil fuel, for it could be kept for spare and auxiliary purposes, and then they would be able to quote a tariff which would be more to the benefit of the inhabitants than any advantage they derived from cutting rates at the present time. In the meantime, he supposed, the competition must continue, and so they had earmarked the £15,000 placed to reserve as a Tucuman contingency fund, and this, so long as was necessary, would be resorted to to meet any losses at that place. They were confident that by doing this they would maintain their position over the next few years, apart from the fact that the growth at La Plata and Ensenada was likely to meet any such losses at Tucuman.

MR. R. MILLER seconded the motion, and the report was adopted.

Shanghai Electric Construction Co., Ltd. — The directors report that the accounts for 1912 show a profit of £24,727, against £14,139 for 1911. Including the sum brought forward, the amount available is £28,028. There has been transferred to reserve for renewals account £8,500, and there has been applied in reduction of the preliminary expenses account £1,554, leaving £17,974. The directors recommend a dividend of 5 per cent. for the year, less income-tax, leaving to be carried forward £1,974. The percentage of loss by exchange on subsidiary coinage was higher in 1912 than 1911, but has recently shown a tendency to decrease. The loss under this head for the year was £23,937, and is almost equal to 7½ per cent. on the capital. The sanction of the Municipal Council of Shanghai has been obtained to a new type of motor-car, and the rolling stock is being increased this year by 15 motor-cars and 10 trailers, raising the total numbers to 80 and 40 respectively. In addition, further facilities have become necessary to meet the growing traffic, and an application to the Municipal Council to introduce a system of railless electric traction has resulted in the sanction of a preliminary installation in Fokien Road. It is anticipated that such a system affords the best means of dealing with traffic in thoroughfares which are too narrow for tramways, and that, as the initial expense of laying a permanent and costly roadbed is avoided, the financial result should prove profitable to the company. The power agreement, under which the company purchases electrical energy from the Council, became due for revision as regards rates in March, and negotiations for a reduction in price are in progress. Through running was inaugurated on June 19th last, on which date the lines of this company and of the French Tramway Co. were linked up *viâ* South Chekiang Road Bridge, and on August 18th through running over the reconstructed Bund Bridge commenced. Increased traffic has resulted, but the full benefit of the through running cannot be obtained until an increased service of cars and through tickets are provided for.

Mexborough and Rawmarsh Construction Syndicate, Ltd.—The directors' report, given in the *Financier*, states that the net revenue account of the Mexborough and Swinton Tramways Co., after providing £91 for depreciation on furniture, fittings, plant and tools, and on motors, &c., on hire, and writing £201 off stock, is £5,043, plus £152 brought forward. After providing £1,500 for reserves for the tramway and lighting undertakings, there is a balance of £3,695, out of which the syndicate will receive £3,501. The balance to the credit of the syndicate's profit and loss account for the year to December 31st is £3,522, to which has to be added £172 brought forward, making a total of £3,695. The directors recommend the payment of a dividend of 2 per cent., free of tax, amounting to £3,500, and that the balance of £195 be carried forward. The decrease in the traffic receipts of the Mexborough and Swinton Tramways Co., as compared with those for 1911, is a result of the national coal strike, mining being the chief industry in the district served by the tramways. The traffic receipts to May 5th of this year show an increase of £776 over those for the corresponding period of last year. The revenue and expenditure of the lighting undertaking were also affected by the coal strike, the increased cost of fuel alone amounting to £328. The tramway company's consulting engineers having advised that the present plant is inadequate to deal with present and future requirements of the company, the directors have decided to instal additional plant, involving a capital expenditure of about £5,000 Considerable economies in working costs should be effected by this installation.

Brazilian Traction, Light and Power Co., Ltd.—There has been published in the daily Press a copy of a circular sent out to shareholders, calling a meeting for May 23rd at Toronto, at which a resolution will come forward to create an issue of $10,000,000 par value of 6 per cent. cumulative preference shares (100,000) for the purpose of meeting the requirements of the Rio de Janeiro Tramway, Light and Power Co. and Sao Paulo Tramway, Light and Power Co., of both of which the company is the principal shareholder.

Nairobi Electric Power and Lighting Co., Ltd.

THE meeting of this company was held on May 7th at the office, 50, Mark Lane, E.C., General Sir Stanley Edwardes, K.C.B., presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELEC. REV., page 652), said that the capital expenditure on works now stood at £32,368, an increase during the year of £3,001. The property account stood at £513, an increase of £238, due to the purchase of a town stand on which the company's new offices and stores were to be erected. Stocks on hand and in transit at £3,363, were only a trifle higher than at the end of the previous year. On the other side of the account, the share capital had increased to £23,000 by the issue to the vendor of the balance of the purchase price payable to him. The increased capital expenditure of over £3,200 had been partly met by the issue of a further £2,000 debentures, and the balance had been provided out of revenue. Passing to the revenue account, the principal item of sale of current amounted to £5,400, an increase of £1,044, this being nearly 20 per cent. increase. The other items of receipts also showed satisfactory increase, making the total £7,607, which was £1,811 more than in the year before, or 31 per cent. increase in gross receipts. The expenses naturally showed some increase in an expanding business, but in the past year they had had to face some abnormally heavy expenditure. The directors expected that for the present year they would have a substantial further increase of gross receipts, with a smaller expenditure than for 1912. No sum had yet been set aside for depreciation. The plant had been efficiently maintained out of revenue, and, in view of the fact that the company held properties acquired in its early days, before the great increase in local values of the past two or three years, which properties were estimated to have a realisable cash value considerably exceeding the amount of depreciation on machinery and plant, the directors were of opinion that the position of the company was quite sound in this respect. The result of the year's working was a net profit of £2,643, and, after wiping out the adverse balance remaining in revenue account at the end of the previous year, there was left available a net balance £1,456. There was a contingent liability of the dividends on the cumulative preference shares, and the directors duly declared and paid in January last by way of an interim dividend, the preference dividends for the years 1906 and 1907, during which years the shares were being taken up and paid for. This absorbed £532, thus leaving a balance of £923 still available for dealing with. The directors had decided that while the available balance was more than sufficient to pay the preference dividend for another year, it would strengthen their financial position to defer the payment of such a dividend for a short time.

The HON. R. C. BAYLDON seconded the motion, and the report was adopted.

Great Northern Telegraph Co., Ltd., of Denmark.

THIS company held its meeting on April 26th at Copenhagen. The chairman (Commodore E. Suenson, D.R.N.), in his account of the working during the year 1912, said that, in spite of the disturbances nearly all over the world caused by war and political or social conflicts, commencing in 1911 with the revolution in China and the war between Italy and Turkey, and followed in 1912 by the sanguinary struggle between the allied Balkan States and their common enemy, &c., the company's telegraphic system had worked quite normally, thanks to its distant situation from the principal theatre of events. During the year 10 of their cables in Europe had been interrupted 12 times, whilst six in Asia had been subject to 15 interruptions. Their cable steamers had been less engaged in repairing their cables than during the previous year, and they had also had less to do for other administrations. The *H. C. Orsted* had been occupied in Europe for 62 days, of which 15 were for the account of other administrations, against 165 and 32 respectively in 1911; and the *Store Nordiske* and *Pacific* in the Far East for 230 days, of which 68 were for other administrations, against 281 and 120 respectively.

The movement which had manifested itself in Outer Mongolia and also in Thibet for a separation from Chinese domination had fortunately, so far, not seriously affected the transmission of their traffic between Europe and the Far East, either by the Kiachta route, which traversed the whole of Mongolia, or by the Wladiwostock route, which on Russian territory skirted the whole of the frontiers of Mongolia and Manchuria. On the contrary, the authorities of those countries seemed to take special interest in protecting and maintaining the lines, and in conserving their discreet and neutral service. The company's negotiations with Japan regarding future relations with that Empire after the expiration of the company's exclusive privileges, were resumed in July last after a suspense of several years. These negotiations had kept the company fully occupied both in Japan, at Tokio, and here in Europe, because the wishes and proposals of Japan made it necessary for this company to obtain the consent of several of their concessionary Governments, and also the concurrence of other Government and private administrations interested in the transmission of the traffic with Japan and with other countries in the Far East. All these negotiations had necessarily taken a considerable time, and they were further delayed by the death on July 30th last of the Emperor of Japan.

In spite of all these obstacles they had by means of mutual concessions, succeeded in arriving at an understanding with the Imperial Administration embodied in "Heads of Agreement," which were signed at Tokio on December 28th, 1912, the date of expiration of their exclusive privileges, and shortly afterwards approved by the Imperial Government.

The stipulation of these "Heads" fixes in principle the solution of all questions in dispute, and also the future relations between Japan and the company in a sufficiently clear and detailed manner so as not to leave any doubt as to their definitive interpretation.

The main points are the following:—

1. The company loses its exclusive privileges in Japan without any compensation whatever.

2. The perpetual rights of the company with resulting duties and obligations will be embodied in a new document in conformity with the terms of the old concessions.

3. It was of great importance to Japan to arrange for the laying of a Government cable between Nagasaki and Shanghai for the transmission of telegrams written in Japanese Kana characters, and for Government telegrams exchanged terminally between Japan and Shanghai. They also desired to use the existing Japanese cable between the island of Formosa and Foochow, which had hitherto carried only terminal Formosan traffic, for the transmission of all telegrams from and to the whole of the Japanese Empire.

Although the realisation of these wishes would consitute an infringement of the privileges granted by China to the company until 1930, and shared by the Eastern Extension Co., they had with the approbation of the Chinese Government agreed to the wishes of Japan, but, in order to avoid too serious a competition between all the interested parties, subject to the condition that a joint purse arrangement be made for the next 18 years for the division of the receipts between Japan, China and the company, in an impartial manner to be fixed beforehand.

4. Lastly, the sacrifice which would most seriously affect the financial interest of the shareholders was: Large and numerous tariff reductions varying from 20 to 57 per cent. of the old rates for the different classes of Japanese correspondence. These reductions were the more perceptible because it would be impossible to grant several of them to Japan without also granting them to China and other countries in the Far East. In 1870 and 1871 these countries, simultaneously with Japan, were brought by the company into telegraphic communication with the rest of the world, and they had honoured the company with the same confidence and hospitality as they had enjoyed in the Empire of the Rising Sun.

There was another Great Power which through its honoured and respected organs manifested its salutary influences everywhere, viz., "The World's Press," for whose benefit they desired to make considerable tariff reductions in the hope that its telegraphic correspondence with the Far East would lead to a more intimate and intelligent mutual knowledge and a more cordial understanding between the peoples of the East and the West.

The introduction of the aforementioned reduced rates would result in a very considerable, and as yet indeterminable, decrease in their telegraphic receipts. The board, nevertheless, accepted it with equanimity, thanks to their reserve and other funds. It was an advantage that the reductions would probably not come into force for another month or two, because the losses of the first 12 months under the new régime would thereby be distributed over two financial years of the company.

Another, and a still greater advantage, was that the financial receipts of the year 1912 had been considerably better than those of the preceding year, in which the loss of the Norwegian concessions caused a perceptible decrease in the receipts. During the last year the receipts had risen afresh, thanks to the extraordinary events of the year which, without interfering with the stability and working of the lines, had created an almost prodigious increase in the telegraphic correspondence. The receipts had been large enough to enable them to propose an increase of the bonus by 2 per cent., or a total distribution of 20 per cent. for 1912, in spite of the large loss of revenue which they expected to have shortly. Shareholders were, however, recommended not to draw conclusions too lightly as to the future from the increased bonus this year, the prospective losses being, as previously stated, impossible to estimate at present.

The chairman went on to refer to the placing of an exceptional dotation of £16,600 to the pension fund, as a well-merited appreciation of the fatiguing work of the employés. Traffic receipts had increased by about £57,850, but of this £19,680 was due to the fact that the loss on exchange of the previous year of £7,160 had this year been changed to a gain of about £12,250; interest had decreased by £670, whilst sundries had decreased by £3,500. The total expenses had increased by £9,520. Participation in other telegraph undertakings had decreased by £16,480, representing the amortisation of the advances made to the Chinese Administration. The board had thought it necessary to write off about £69,400 in consequence of the decreased value of investments through the universal depreciation of gilt-edged securities during the last few years.

Singapore Electric Tramways, Ltd.

THE ordinary general meeting was held on Tuesday at the offices, 19, St. Swithin's Lane, E.C., Sir Frank A. Swettenham presiding.

The CHAIRMAN, in proposing the adoption of the report (see ELECTRICAL REVIEW, page 776), said that during the past year £3,900 worth of debentures had been paid and cancelled, thus reducing the total debenture liability to £326,500. The tramway undertaking stood at £678,757, as against £689,055 at the end of 1911. A small expenditure of £1,828 had been incurred on capital during the year in respect of additions to buildings, plant, workshop equipment, &c. The cash and loans stood at £39,717 as against £27,072 in the previous year. The traffic receipts had increased by £1,446, and sales of energy to the Government and the municipality by £1,865. The working expenses had risen from £42,613 in 1911 to £43,916, due almost entirely to the increased cost of fuel. The profit of £5,358 reduced the debit balance on the profit and loss account to £3,824. The reduction of the debit balance, which at December 31st, 1908, stood as high as £16,200, and in 1911 and 1912 was reduced by £5,055 and £5,358 respectively, was conclusive evidence of the progress which the company was making, and they hoped that the next accounts would show not only that the debit balance had disappeared, but that its place had been taken by a credit.

Whilst the passenger receipts and the number of passengers carried had increased, the general manager had been able again by carefully studying the traffic requirements, to reduce the car-mileage. That was a satisfactory feature as considerable wear and tear of rolling stock was avoided and working expenses were consequently reduced. The increase in the number of passengers carried was 398,080 as against an increase in 1911 over 1910 of 344,155. The decrease in car-mileage was 29,698 miles following a decrease in 1911 of 75,402 miles. The passengers carried per car-mile were 6·71 in 1912 and 6·42 in 1911 and receipts per car-mile were 7·44d. in 1912 as against 7·30d. in 1911, whilst the expenses per car-mile had advanced slightly—from 4·03d. in 1911 to 4·12d. Considering only the tramway undertaking the expenses represented 57·25 per cent. of the receipts, but the total Singapore expenses represented only 52·66 of the total Singapore revenue, compared with 56·96 per cent. and 52·64 per cent. in 1911. The Singapore tramway ordinance of 1902 fixed the maximum charges to be made for energy by the company, but they had found it to be in their interests to charge considerably lower rates and to give special terms in exceptional circumstances. With the rapid advance in the application of electricity all over the world since the ordinance was granted, it became necessary on nearing the last quarter of their ten years' period of supply, to consider the possibility of competition or of the municipality laying down its own plant. The company, therefore, approached the municipal Commissioners in regard to a renewal of the contract, and after very lengthy negotiations an extension had been granted. The municipality had decided to add to its field of electrical supply the residential districts of Tanglin, and it had granted them an extension for ten years from the date of the current first being supplied to that district. A reduced scale of charges had been agreed upon, and whilst the new scale would naturally not yield the same amount of profit as the old, it was hoped that the increased output would counteract the reduction in price. The traffic receipts for 1913 already showed an increase over the corresponding period of 1912 of $18,944, or over 9 per cent., equal to an increase of $997 per week. That increase in 19 weeks compared very favourably with the progress of 1912, for the increase during the whole year only amounted to $10,697. He thought the shareholders would agree that they had good reason to be satisfied with the work done by the general manager and his assistants in Singapore.

Sir Charles Petrie, J.P., seconded the motion.

Mr. Bles said he thought that an expenditure of £43,000 to secure a profit of £22,000 was altogether too large a proportion. He considered that too much was being spent on ticket inspectors, and he also thought there should be a reduction in fees paid to the board.

The Chairman, in reply, said that the expenses of the company compared with its revenue were about as moderate as could be found anywhere—in fact, he thought they were extraordinarily moderate, in view of the condition under which the work was carried on. If they were to spend less on inspection, they were advised that the receipts would immediately decline. With regard to the directors' fees, that point had been raised at previous meetings, and in consequence, one director resigned. The affairs of the company were now in a much better condition than they were some years ago, and he could assure them that the management of the concern gave the board a good deal of anxious thought and consideration. If the shareholders wished to reduce the fees, they would have an opportunity of doing so by refusing to re-elect the retiring directors.

The report was adopted, and the retiring directors, Sir John Anderson and Mr. F. Baynes, were unanimously re-elected.

West India and Panama Telegraph Co., Ltd.

The meeting was held on May 7th, at Winchester House, E.C., under the presidency of Mr. W. B. Kingsford.

In moving the adoption of the report, the Chairman said that the amount to the credit of revenue was £38,508, a decrease of £2,098, as compared with the corresponding half year in 1911. The traffic receipts were £1,805 less. They attributed that decrease mainly to the reduction of the rates to which he referred at the last meeting. There had been rather a short sugar crop in the islands, which also accounted for some part of the decrease. The expenses compared favourably with the corresponding period, being about £2,500 less. They used 18 miles less cable in repairs than during the previous half-year, and they also hired their repairing steamer for a few days to the Cuba Submarine Co., and they sold a quantity of cable core, thus reducing the expenses attending the maintenance of cables from £9,103 to £6,429. In the working expenses at stations there was a new item of £86, share of pension fund at a joint station. That arose from the fact that the Cuba Submarine Co. recently established a pension fund for the benefit of their staff in Cuba. The station from Santiago to Cuba was worked jointly by the West India Co. and the Cuba Co., and therefore they felt bound to share equally in the expense of the pension fund at that station. The West India and Panama Co. was almost the only telegraph company which did not have a pension fund. The directors regretted that that was so, but they felt that to establish a fund on the lines of other companies would be too costly a matter for them to entertain. They thought, however, that a plan for granting allowances to the London staff on retirement after 40 years' service could be arranged without in any way increasing the present expenses of the London office. He felt sure that such a proposal would have the cordial approval of the shareholders, and they proposed to ask their sanction to the same at the next meeting. The development of the oil industry in Trinidad was being watched by them with much interest. They understood that a powerful syndicate had recently been negotiating with one of the principal oil companies in Trinidad to obtain an interest in its property, and that the necessary arrangements had now been concluded. The successful development of that almost new industry could not fail to be beneficial to the commerce of Trinidad, and, incidentally, to their company. A Danish company was formed some few months ago to undertake the work of deepening the harbour at St. Thomas, and carrying out other extensive improvements there in order to give better anchorage and wharf facilities for large steamers. The work had been commenced, and when it was finished, they might reasonably hope that those largely increased shipping facilities would tend to the creation of additional business, as the headquarters of the company were at St. Thomas.

Mr. Henry Holmes seconded the motion.

The Chairman, in reply to questions, said that, at present, they were not inclined to entertain the notion of extending wireless communication between the islands. At present they had wireless connection between Trinidad and British Guiana. With regard to any projected amalgamation, he had never mentioned the subject at any of their meetings, as they had never been approached by any other company with any proposals to that end. Of course, if any favourable opportunity should arise for entering into an amalgamation, or of doing anything else for the improvement of the company, they would only be too glad to enter into the question.

The report was adopted.

South Metropolitan Electric Tramways and Lighting Co., Ltd.—The directors report that the total revenue for the year to December 31st from all sources amounted to £61,944, compared with £59,222 for the preceding year. The expenses, according to the *Financier*, were £36,144, compared with £35,054 for 1911. The net revenue was therefore £1,631 more than in 1911. After deducting all expenses chargeable to revenue, including payments to local authorities under agreements and interest upon the debenture stock of the company, and after setting aside £3,000 to the renewals fund, there remains a surplus of £15,492, plus £604, brought forward. The directors propose to place to reserve £5,000; to pay a dividend at the rate of 6 per cent. per annum on the preference shares for the year, £10,174; leaving to be carried forward £922. The gross receipts from the tramways and light railways were £45,141, a decrease of £388, and the working expenses amounted to £24,509, an increase of £127. There was a decrease of £491 in traffic receipts for the year, which is attributable to the unfavourable weather, and to the fact that the Festival of Empire was held at the Crystal Palace in 1911. The gross receipts for the electricity supply section (including the amount represented by the sale of energy to the tramways) amounted to £14,124, and the working expenses to £7,184. The total number of units sold during the year, including 192,736 supplied to the tramways, was 920,316, as compared with 836,122 in 1911. The number of units sold for lighting and power purposes was 727,580, an increase of 86,255 units, or over 13 per cent. The number of consumers at December 31st was 1,535, as compared with 1,355 at the corresponding date of the previous year, an increase of over 13 per cent. The receipts for 1912 exceeded the receipts for 1911 by £1,340, whilst the working expenses were £751 in excess of those for 1911. Most of this increase in expenses was due to the increased output, but a considerable portion was attributable to the higher cost of fuel and the rise in price of all other materials. The Cheam Parish Council has accepted the company's tender for lighting of certain streets in Cheam (where cables are already laid) for a period of five years. A proposal is submitted to the shareholders that they should exchange their holdings for shares in the London and Suburban Traction Co., Ltd.

Craigpark Electric Cable Co., Ltd.—The tenth annual meeting was held in Glasgow on Monday, Mr. W. S. Brown presiding. The chairman, in moving the adoption of the report (see Elec. Rev., page 775), said that the profits for the year had been far better than the profits for the previous 12 months, which was due to the company doing a much larger trade upon the occasion under review. They had had, however, many difficulties to contend with, fuel had been very expensive, and there was a heavy increase in expense through the Insurance Act, and on other matters. The works were well employed at present, in fact they had never had so many orders upon their books. Some of the shareholders were aware that they had a golf-ball business as a subsidiary section of their concern. Owing to the high prices of rubber, it was not worth taking part in for some time, but they had put a new ball on the market, and experts had spoken highly of it. They intended to make this a more important part of the business as a dividend-earning section.

Lima Light, Power and Tramways Co., Ltd.—The directors report that the total profits obtained during 1912 were £p.175,156; less—bond service, £p.62,904; interest and discount, £p.7,795; European expenses, £p.1,762; provision for bad and doubtful debts, £p.2,805; provision for extraordinary renewals £p.1,000; leaving a net profit of £p.98,890. There is to be placed to reserve and redemption fund, £p.25,994; a dividend of 4 per cent. requires £p.53,996, leaving a balance of £p.18,900, out of which an additional dividend of 1¼ per cent. is recommended in respect of 1912, carrying forward £p.2,026.

Auckland Electric Tramways Co., Ltd.—The directors have declared an interim dividend of 7½d. per share, free of income-tax, on the ordinary shares for the half-year ended December last.

Sunderland District Electric Tramways, Ltd.

THE report of the directors for the 12 months ended October 31st, 1912, states that during this period the property was still in the hands of the Receiver, who controlled the outgoings. After providing for interest on the prior lien bonds, the first and second mortgage debentures, and the expenses of the receivership, the accounts show a loss on the past year's working of £1,175, bringing the aggregate loss to date up to £18,065. In consequence of the coal strike in the early part of last year, the traffic receipts show a decrease of £483; but, on the other hand, a saving was made in working expenses, which averaged 61·22 per cent. of the gross receipts, as against 64·68 per cent. for the previous year. Since the close of the year on October 31st, the scheme of arrangement referred to in the last report has been carried into effect, and the board has again assumed the entire management and control of the company. The new prior lien bond money has now been received, and the old prior lien holders have been paid off. The balance of the money provided under the scheme, together with that handed over by the Receiver, is sufficient to provide the new cars required and to make other needed improvements. Certain additions and alterations have been made to plant, machinery and permanent way, which should still further reduce operating expenses. For the 26 weeks for the current financial year, the traffic receipts show an increase of £2,175 over the corresponding period of last year, and the general position of the undertaking may be regarded as much more satisfactory than it has been for some years past. Messrs. Charles Eves and Albert Counter, who were appointed directors in accordance with the arrangement made with the new prior lien holders in December last, offer themselves for re-election.

The revenue account on the debtor side shows the following:—Expenses at Sunderland, power, £2,489; operating, £6,050; repairs and renewals, £3,972; management expenses (including salaries, rents, &c.) £2,630; a total of £15,141. Trustees' fees (prior lien bonds and first and second mortgage debentures), £273; directors' fees (May 1st, 1910, to October 31st, 1912), £773; there is a balance carried down of £9,849. On the credit side, traffic receipts are £23,778; advertising parcels, &c., £648; sundry sales, £126; royalties receivable (annual royalty under agreement and royalty on current supplied), £1,586; and other small items make a total of £26,349.

Cuba Submarine Telegraph Co., Ltd.

MR. GEORGE KEITH presided over the meeting of the company held on May 7th at 58, Old Broad Street, E.C.

In moving the adoption of the report (see ELECTRICAL REVIEW, page 732), the CHAIRMAN said that the monthly traffics, as a whole, compared favourably with those of the corresponding period of the previous year, notwithstanding the reduction which had taken place in some of their through rates during the year. The rainy or slack season in Cuba generally began with June, but last year the exceptionally dry and favourable weather enabled the milling of the sugar canes to continue much longer than usual, which accounted for the increase shown in the July traffic. The total in December also showed an increase, due principally to interruptions in other lines, which brought them traffic outside their usual business. The traffic of the other months was somewhat short of what it was in the preceding year. As regarded the revenue account, there was an increase of £520 in the traffic, while interest showed a decrease of £136 in consequence of the sale of some of their securities to meet the cost of laying the Cape Cruz-Santiago cable. The total revenue, including transfer fees, amounted to £19,073, or £383 more than in 1911. Altogether the total expenditure amounted to £7,085, or £586 more than in 1911. The result of the year's business gave a profit balance of £11,988, out of which £2,000 had been added to the pension fund and £2,000 carried to the general reserve. After providing for a dividend on the preference shares, the directors recommended the payment of the usual dividend at the rate of 6 per cent. per annum on the ordinary shares, and increasing the balance carried forward by £188 to £7,931. In the balance-sheet the general reserve fund now stood at £94,000 and the pension fund at £4,115, which included the interest accrued on the same. The investments, less reserve for depreciation, remained the same as last year. Their market value had considerably depreciated since the commencement of the Balkan war, but it was hoped when peace was finally arranged they would appreciate and make it unnecessary to increase the depreciation reserve. This year business generally in Cuba and the West Indies continued prosperous, and the traffic passing over their cables up to the present was satisfactory, although not quite up to what it was for the corresponding period of last year, which was very exceptional. In these days of low rates the amount earned per message was gradually falling, and they had to do a great deal more work for the money received. Their cables were all in a perfect working condition. It was, however, with much regret he had to mention that their Cienfuegos building was completely wrecked in February by the terrific explosion at a store on the opposite side of the street. One messenger was killed, and four of their staff were seriously injured. Fortunately their manager escaped with a severe shock and was able to resume charge immediately after the disaster. Business at Cienfuegos had since been carried on in a temporary office, but steps were being taken to fit up a new building in the place of the old one. In conclusion, the chairman said that he hoped the proposal to hold only one meeting during the year would meet with the shareholders' approval, because he thought that dealing with the year as a whole would give the shareholders the opportunity for comparing the progress made.

MR. C. W. PARISH seconded the motion.

In replying to a SHAREHOLDER, the CHAIRMAN said that the damage done to the station at Cienfuegos was covered by insurance.

MR. LIDDON said he noticed that their shares had been quoted very much lower than usual for some time and he asked the chairman if he could give any explanation of that.

The CHAIRMAN said it was impossible to explain the fluctuations in shares on the market. The reduction of the rates naturally reduced the amount received per message.

The report was then adopted.

Eastern Telegraph Co., Ltd.

THE directors report that for the six months ended December 31st, 1912, the revenue amounted to £753,326, from which are deducted £273,246 for the ordinary expenses, and £82,904 for expenditure relating to maintenance of cables, sundry differences in exchange, and income-tax payable abroad, leaving £397,176, plus £52,418 brought forward, making a total available balance of £449,593. After providing for income-tax payable in England, interest on mortgage debenture stock, and dividends on the preference stock, which in all absorb £83,212, there remains £366,382, out of which the directors have placed £160,000 to the general reserve fund, and have paid an interim dividend of 1½ per cent. on the ordinary stock, amounting to £50,000. The directors now recommend a final dividend on the ordinary stock of 1½ per cent. and a bonus of 2 per cent., amounting together to £130,000, both payable on May 21st, free of income-tax, and making, with the three previous payments on account, a total distribution of 7 per cent. for the year ended December 31st, 1912. It is proposed to carry forward £26,382 to the next account. As foreshadowed at the last general meeting, it has been found necessary to increase the carrying capacity of the cables east of Suez, and the board has, therefore, decided to carry out important renewals to one of its Red Sea and Aden-Bombay sections. An additional cable will also be laid between Suez and Aden, and application has been made for landing rights for a cable between Aden and Colombo, to join the new cable from Colombo to Penang which has lately been laid by the Eastern Extension Co. A contract has been placed with the Telegraph Construction and Maintenance Co., and instalments of cost amounting to £65,100 have been charged against the general reserve fund. The present articles of association which have been in force for many years are out of date in some respects. New articles of association will be submitted for approval at the general meeting on May 21st.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors report that the gross receipts for the half-year to December 31st, amounted to £379,445, against £359,596 for the corresponding half-year of 1911. The working expenses, including £19,774 for maintenance of cables, absorb £154,779, against £159,232, leaving £224,666. From this is deducted £3,766 for income-tax payable in England and £15,048 for interest on debenture stock, leaving £205,851 as the net profit for the half-year. After adding £56,684 brought forward, there is an available balance of £262,535. One quarterly interim dividend of 1¼ per cent. has been paid for the half-year, and it is now proposed to distribute another of like amount, making, with the interim dividends paid for the first half-year, a total dividend of 5 per cent. It is also proposed to pay a bonus of 4s. per share, or 2 per cent., making a total distribution of 7 per cent. for 1912. £100,000 has been transferred to the general reserve fund and £27,535 carried forward. The general reserve fund has been debited with £50,000 as a further provision on account of investment fluctuations, bringing the total provision against depreciation up to £200,000. In pursuance of the policy indicated by the chairman at the last general meeting, of strengthening the company's cable capacity in the Far East, contracts have been entered into with the Telegraph Construction and Maintenance Co. for the manufacture and laying of new cables between Colombo, Penang, Singapore and Hong-Kong. The first section was completed a few days ago, and the expenditure on this account up to the end of last year (£86,704) has been charged against the general reserve fund. The other sections are expected to be completed in the early part of next year.

Western Telegraph Co., Ltd.—For the half-year ended December 31st, 1912, the directors report that the revenue was £438 888, and the working expenses £176,474. After providing £16,373 for debenture stock interest, and £8,361 for income-tax, there remains £237,679, plus £33,517 brought forward, making £271,196. First and second interim dividends, amounting to £62.379, have been paid, and after transferring £140,000 to the general reserve fund, £25,000 to the provision on account of investment fluctuations, and £10,000 to the land and buildings depreciation fund, there remains £33,817 to be carried forward.

Cuban Telephone Co.—The directors report that the income for 1912, including $292,640 brought forward, was $1,064,658: $50,000 is transferred to surplus account. After meeting working expenses and other charges, there is a credit balance of $498,379. Four quarterly dividends of 1 per cent. each were paid on the common stock.

Simmonds Bros., Ltd. — A petition to the Courts to confirm reduction of capital from £50,000 to £29,505, will be heard on May 27th.

Callender's Cable and Construction Co., Ltd.

Sir J. Fortescue Flannery, Bart., M.P., presided on May 8th, at Hamilton House, Victoria Embankment, E.C., over the seventeenth annual general meeting of the company.

The Chairman, in moving the adoption of the report (see Elec. Rev., page 733), first referred to the loss sustained by the company in the death of the late chairman, Mr. H. Drake. The number of the board had been decreased not only by the death of Mr. Drake, but by a previous loss, and the directors were considering the question of replacing these losses. He was pleased to present a report and balance-sheet which he believed would be considered very satisfactory, and which would have been even more so but for labour troubles. Just a year ago there was the coal strike, affecting practically the whole of the mining industry throughout the country. This strike, whilst embarrassing the operations of all manufacturers at the time, had resulted in a permanent increase in the cost of coal, which must in the end prove an international disadvantage in raising the cost of what was the very life blood of the manufacturing interests of Great Britain. Six months ago there was a strike, which, whilst less national in its character, affected the company very seriously. He referred to the strike of lightermen upon the Thames. Their works at Erith were very advantageously situated upon the banks of the river. They had a wharf which had excellent appliances for the reception of their raw materials sea-borne, and for the discharge into ships of their manufactured finished products. Greatly to their advantage, the bulk of their trade was sea-borne trade, so that they were affected in the most serious manner by the stoppage of the traffic. The thanks of the shareholders were due not only to the managing director, but in this connection to the subordinate officials, for the very special and successful efforts they made to minimise the loss and inconvenience during the strike, the result being that, serious as was their loss, still it was much less than it would have been but for the efforts of these officials. Then they had another labour difficulty of a more direct kind. They employed a large number of engineering workmen at their Erith factory, and he was sorry to say there was a dispute between them and the company, which lasted, however, for only a comparatively short time. Long ago it had been amicably settled, and that day he was able, with the utmost satisfaction, to report that their relations with their employés in all their works, both in the South and in Lancashire, were excellent. The employés had regular employment and a standard rate of wages, and every advantage that could reasonably be expected, and they looked forward to a continuance of the good understanding between employés and employer so far as they were concerned. Last year they turned out more work than in any preceding year in the history of the company. Some was at competitive prices, leaving little or no margin of profit, while some was at competitive prices which did leave a profit. The result, taking it all round, was that they had had a better year than ever before. At the Erith Works they manufactured heavy cables, and in Lancashire they manufactured rubber goods and did lighter work generally. They had transferred the plant for the manufacture of telephone cables to Erith, because they wanted more room in the Lancashire works for their extending trade, and they had charged the cost of this to revenue. They had enlarged the works in Lancashire. These works were very favourably situated in respect to canal transport and otherwise, and they were thoroughly well satisfied with what had been done in connection with them. The policy of maintaining all their plant out of revenue, which had always characterised the company, had been again carried out during the past year. The enlarged trading of the company had necessitated more capital, and the board were very unwilling to increase the direct burden on revenue by issuing more shares or debentures; they therefore formed a subsidiary company, known as Callender's Share and Investment Trust, Ltd., the object of which was to convert into available liquid capital, to be used in the company's trading operations, part of the money invested by the company in past years in securities which had been held since. He was glad to tell them that this investment proved a most attractive one, and the whole of the capital was readily absorbed. The result of the year's operations showed a balance to the credit of profit and loss of £97,000, as compared with £77,000 in the previous year, which with the £58,000 brought in from 1911, gave them £155,000 to deal with. After deducting the debenture interest and preference dividend and depreciation, they were left with a balance of £117,000, as compared with £84,000 a year ago, and it was proposed to pay a dividend of 10 per cent., and a bonus of 5s. per share, and to carry forward £91,745. The question arose as to whether a part of this £91,000 should be put to reserve, but they knew that when money was put to reserve, it was locked up, whereas if they carried it forward it was equally a good reserve, but remained liquid, and available generally for the purposes of the company. Therefore, in view of the extending trade of the company, they thought it wiser to carry the money forward. There was no need to go through the figures in the balance-sheet, and he need only say that owing to the larger trade the company had done there were increases in most of them. They had had during the year the most skilled and indefatigable attention to the interests of the company by Mr. T. Callender, the general manager, and his two associates, Mr. Petersen and Mr. James Callender. The managing director made a journey to India in the interests of the company's business, and whilst they were sorry to lose him at home during that time, yet he left behind him very efficient substitutes in the two colleagues he had named. As only four months of the present year had elapsed, it was too early for them to be certain of the results which would accrue in 1913, but, so far as they could judge, their prospects were excellent. They were full of orders received from customers at home and in the colonies, and he hoped that the balance-sheet they would present 12 months' hence would be as good as the one he put before them that day.

Mr. T. Callender, in seconding the motion, said that, in looking back on the past year, they found it was one in which they had had a great deal of trouble and a great deal of anxiety, but also, fortunately, a very large amount of work. Their factories never were fuller of work than in 1912. They started this year under very excellent circumstances, as the factories were full. They had as much work as they could do at present, and there was every prospect of that excellent condition of things continuing for some time at least. From their knowledge of the trade, and the experience they had of the views of their customers at home and abroad, they thought that, unless some serious political disturbance took place or some great labour trouble occurred, the output of 1913 would be good; and he hoped, when they met next year, they would have an excellent report to lay before the shareholders. So far as their business was concerned, they were extending on every side, and were always opening up some new agency or department. A few minutes before coming there, he was in consultation with one of their engineers, who only returned the previous day from Switzerland, where he had been testing cables which the company had supplied, and this was the first occasion on which any English company had done any such work in that country. Their progress had also been considerable in various parts of Germany, Belgium, Spain and elsewhere on the Continent. Their overseas business in the Colonies and in South America was also large and increasing, and they were leaving no stone unturned to bring their products before electrical consumers everywhere. He considered it of sufficient importance to go himself to India and spend some weeks meeting those at the head of affairs with whom they were in the habit of dealing, and he was thoroughly well satisfied with the results of his journey. There was very little to tell the shareholders, because such history as they had made was told in the profit and loss account, the reading of which should give satisfaction to every shareholder. As usual, they had dealt most liberally with the replacement of machinery, and an increased business necessarily meant more wear and tear and added to the cost of repairs. During the year the large staff, both at home and abroad, had been of the utmost assistance, and had worked in the most loyal way, and no company could be better served.

The report was adopted without discussion, and the retiring director and auditors were re-elected.

West Coast of America Telegraph Co., Ltd.—The directors' report for the year ended December 31st, 1912, states that the gross receipts amounted to £53,737, as against £53,891 in 1911. The working expenses were £39,646, as compared with £39,689 for the previous year. After providing £6,000 for the interest on the 4 per cent. debentures and £800 for the interest on the 4 per cent. income-bonds, there remains £7,291, plus £1,182 brought forward, making a total of £8,473. Of this £5,000 has been placed to the general reserve fund, and the directors recommend a dividend of 2½ per cent., free of income-tax, amounting to £2,813, leaving £660 to be carried forward.

Stratford-upon-Avon Electricity Supply Co., Ltd.—Mr. G. M. Bird presided at the annual meeting recently, and, in moving the adoption of the report (see Elec. Rev., page 733), he said that the income from current was £123 in excess of that of the previous year, and from other sources £30 more. Expenses were up by £75. The units sold for lighting and heating showed a considerable advance, but the power units were somewhat down, as the principal consumers, the mill-owners, had no necessity to use it owing to the heavy rains of the season. With a dry summer, however, this would come on again. Their coal contract was higher, and they had had a slight breakdown to one of the engines—both of these items would somewhat increase the expenses of the current year. The report was adopted.

International Railophones, Ltd.—The *Times* states that at the annual meeting of this company, held on 21st ult., it was resolved to offer at par the balance of the unissued capital, amounting to 1,746 shares, to the existing shareholders *pro rata* to their present holdings. An agreement has been made regarding the working of the patent rights for Germany.

Thomas Tilling, Ltd.—In their report for 1912, the directors mention that during the year they acquired a preponderating interest in the business of W. A. Stevens, Ltd., motor manufacturers and engineers, who are the patentees of the electrical portion of the "Tilling-Stevens" motor-omnibus.

London and Suburban Traction Co., Ltd.—An extraordinary general meeting is called for May 21st, at the Holborn Restaurant, at which a proposal will be put forward for increasing the capital from £3,250,000 to £3,600,000, by the creation of 200,000 new preference shares and 150,000 ordinary shares of £1 each.

Bahia Tramway, Light and Power Co.—A meeting has been called for June 5th, at Winchester House, E.C., at which there will be put before the debenture-holders particulars of the proposed sale of the company's undertaking to the Bahia municipality.

Anglo-Portuguese Telephone Co., Ltd.

Mr. Herbert Allen (chairman) presided on Friday, at 48, Cannon Street, E.C., over the general meeting of this company.

In moving the adoption of the report (see Electrical Review, page 777), the Chairman said that last year he expressed the hope that the meeting would be held a little earlier, but sickness amongst the staff at Lisbon delayed the making up of the accounts. This was the twenty-sixth annual meeting over which he had presided, and in looking over the records he found that each year had nvariably shown an advance on its predecessor. For 1912 the gross revenue amounted to £62,919, an increase of £5,874 over the previous year. Their gross profit amounted to £25,195, and their ratio of expenses to receipts was a trifle over 57¾ per cent., which, he believed, compared favourably with that of other similar undertakings. The number of new subscribers connected during the year was 1,283, which was more than double the number of withdrawals, and gave them a net increase of 671 subscribers. This showed that the business in the past year had been very active, and there were no signs up to the present of any falling off in that activity. As the result of the increased revenue, the Portuguese Government obtained £1,780 more in royalties. The total number of calls for the year was 17,993,503, which, at 1d. per message, would equal about £75,000, but as their subscriptions and installation charges were only £60,000, it worked out at an average of about ¾d. per message. Many of them in this country would be glad if they could feel that their telephone messages only cost them on an average about ¾d. They had to be thankful if they got a call at any price sometimes. Unofficially, he would say that if they gave Portugal such a telephone service as the British public had to put up with, they would have been kicked out years ago, and very properly so. However, he did not ask his colleagues to endorse that sentiment. Whilst the increase in the company's business must be considered satisfactory, it must be admitted that the conditions of the country during the period under review were not satisfactory. At the end of January there was a great deal of agitation amongst the working classes, and an attempt made to organise a general strike. It was not altogether successful, but it resulted in the closing of many factories, and the tramway service in Lisbon was brought to a standstill. The Government placed Lisbon under martial law, and for six days they had to have troops to guard the exchange. The working of the exchange during the whole period was very active, and was so satisfactorily carried out that a special vote of thanks to the company was passed by the Portuguese House of Parliament in February. Could they imagine anyone getting up in the British House of Commons and proposing a vote of thanks to the Government for the British telephone service? They had expended £12,670 on capital account on the reconstruction of some of the more important trunk lines of Lisbon and in the laying of 4½ miles of underground cables, which was an expensive matter at first, but led to great economy in the long run. In Oporto also, they made considerable additions to the underground cables. Owing to the large increase in the company's business of late, there had been a certain amount of inconvenience arising from want of space in the central exchange, and after careful consideration it had been determined to erect an additional exchange in the northern part of Lisbon. A site had been obtained from the Municipality, and building operations had commenced. Turning to the revenue, the gross profit for the year was £25,195, and adding £5,382 brought in from last year, they had £30,577 to deal with. Of this, debenture interest and sinking fund absorbed £3,600, and income-tax £868. It was proposed to add £12,500 to reserve as last year, bringing the fund up to the respectable sum of £62,500. This was the sixth year in succession in which they recommended the payment of 8 per cent. dividend, and this on the ordinary share capital of £100,000, would absorb £8,000, and thus leave £5,609 to be carried forward. On the whole, he thought they might congratulate themselves on the progress and stability of the business, and if they never did worse than in 1912, they would not have much to complain of. They were largely indebted to their able staff in Lisbon and Oporto, who deserved their hearty thanks.

Mr. F. W. Kerr seconded the motion.

Mr. Hibbert congratulated the board on the successful year, and said the amount now placed to reserve was a large one. Some time ago the board gave the shareholders a little bonus, and he suggested whether they might not distribute £25,000 to the shareholders in the way of shares.

The Chairman said the little bonus Mr. Hibbert referred to was 33⅓ per cent. Having regard to the fact that their concession was not interminable, they had to be prudent. If the board thought it prudent to distribute any of the reserve fund they would do so, but their first business was to keep the finances of the company sound.

The motion was then carried, and the chairman was re-elected a director.

Stock Exchange Notices.—The Committee has ordered the undermentioned securities to be quoted in the Official List:—

General Electric Co. (of New York)—$4,000,000 5 per cent. gold debenture bonds (London issue), Nos. T1 to 2,700 of $1,000 and OT1 to 2,600 of $500 each, in lieu of the scrip, together with $6,000,000 5 per cent. gold debenture bonds (issued abroad), Nos. T2,701 to 8,500 of $1,000 and OT2,601 to 3,000 of $500 each.

La Plata Electric Tramways Co. Ltd.—£100,000 5 per cent. 1st mortgage debenture stock.

Castner-Kellner Alkali Co., Ltd. — The directors announce an interim dividend at the rate of 18 per cent. per annum for the six months ended March, 1913.

STOCKS AND SHARES.

Tuesday Evening.

At the time of writing, as the newspapers say, the principal influences in Stock Exchange markets are holiday ones. The House has scarcely recovered from its Whitsun rest, and as the settlement of the account takes place this week, fresh business has not developed up to the present to any great extent. Now that there is a definite chance of the Bank Rate coming down still further, the demand for investment securities is again a feature; and even those new issues which are left to a great extent in the hands of the underwriters command attention from bargain-hunters who are on the look out for discounts.

The Home Railway market is somewhat pressed upon by the fact that the bull account in certain of the popular stocks has come into prominence owing to the settlement this week. Apart from this consideration, there is a fairly general opinion that the outlook promises well, so far as can be seen. The labour trouble in Wales appears to have simmered down; and the month of May, so prolific as a rule in labour agitations, is proceeding quietly enough this year. Prices are on the firm side, and after the holiday there was a strong disposition to put prices better. Metropolitans went back a little with the Steam stocks, and Districts eased off to 39½, both of them recovering later on. Nothing fresh has transpired in the Underground group, speculation even in the 1s. shares of the Underground Electric Railways Company having come to something of a stop. British Electric Traction issues remain dull, and although there are no further falls to record, there is also no improvement from the recent steady decline.

The Latin-Canadian group shows considerable firmness. Reliable information from Mexico repeats that a great deal of the recent "news," purporting to come from that country, had its origin in New York. But still, time will be required to allay the nervousness and anxiety caused by the late troubles of Mexico, and evidently there remains unsettlement on an extensive scale. The investor is picking up 1st mortgage bonds of Latin-Canadian companies, while for the time being he is rather ignoring the common shares. The Brazilian Traction, Light and Power Company, as we mentioned briefly last week, is taking powers to issue $10,000,000 6 per cent. Cumulative Preference shares, convertible into Ordinary shares, the issue to take place at par, Canadian terms, on or before June 1st next; and a meeting to arrange for this will be held in Toronto next Friday week.

The issue of 5 per cent. Debenture stock by the Consolidated Baltimore Gas and Electric Company was taken up by the public to the extent of about 50 per cent., and dealings started on the basis of 1¾—1¼ discount, there being ready buyers at the lower price, which, considering the excellence of the security, is natural enough. By the way, another well-covered security is the 5 per cent. 40-year First Mortgage Bonds of the Jardim Botânico Tramway Company, which carries the full guarantee of the Rio Tramways. The price of the bond is 96 middle, with coupons due on January 1st and July 1st. The Rio Company's First Mortgage bonds, with interest payable on the same dates, stand 6¼ points higher.

After their recent bout of mild excitement, Marconi shares have subsided into quietude again, with prices tending to re-act. The effect of Technical Committee's report seems to be wearing off; and with the hint of competition from another direction, the "bulls" of Marconi are not particularly courageous. The old shares eased off to 4 5/16; while Canadians, which rose to 16s. 9d., fell back nearly a florin, Americans and Spanish also being easier, after exhibiting a flicker of strength.

The telegraph market is supported by several good reports. One of these came last week from the Great Northern Telegraph Company, the principal feature of which was a warning note that the proprietors must not take the increase of 2 per cent. in the dividend as being permanently assured, having regard to the reductions in tariffs to the Far East which which will have to be made before long. The Company, however, is in an exceedingly strong position, and it is hoped that the 20 per cent. will be maintained. Anglo-American Deferred came to market this Tuesday afternoon, and the price went back. Direct United States Cable shares have weakened also. West India and Panama Ordinary improved with other speculative issues, but the first Preference shares reacted to 10¼. The Eastern group continues very firm.

United River Plate Telephone shares are now quoted *ex* the rights to apply for the new issue, and on this the quotation moved down to 7¼, which, allowing for the value of the rights, shows practically no net change. The new shares are quoted at 1 premium, and business is being done for cash in the allotment letters. Anglo-Portuguese Telephone 5 per cent. Debenture stock put on another two points. National Telephone Deferred has scarcely moved. The rise in Reuter's new shares went a trifle further, the price now being 11 1/16 middle.

The English Electricity Supply division is firm, the feature being a rise of 1½ in Edmundsons' Debenture stock to 84. County of London Preference hardened to 12, while Edmundsons' shares at 11s. 3d. are 1/16 higher. The Electric Supply Corporation has just issued its report, showing quiet progress. Edison & Swan partly-paid shares are easier at 3s. 9d.

British Westinghouse Preference rose a point, and manufacturing shares, as a whole, are a good market. Rubber shares have taken a distinct turn for the better in consequence of a sharp rise in the price of the raw stuff, which came unexpectedly and found the bears unprepared for it. Gossip says it is going better still, just as gossip, when the price was flat a week or two ago, was lugubrious over the outlook.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations May 13th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord. ..	10	5½	6	9⅛ — 10⅛	..	5 18 5
Do. 4½ % Pref.	10	4½	4½	8⅞ — 9⅜	..	4 14 9
Do. Second 6 % Pref. ..	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	96 — 98	..	4 11 10
Brompton & Kensington, Ord...	5	10	10	8⅞ — 9⅛	..	5 6 8
Do. 7 % Cum. Pref.	5	7	7	8⅜ — 8⅝	..	3 18 10
Central Electric Supply, 4 % Guar. Deb.	100	4	4	95 — 98	..	4 1 8
Charing Cross, West End & City	5	5	5†	4⅛ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	..	4 17 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	8⅜ — 4½	..	5 9 1
Do. Do. 4 % Deb... ..	100	4	4	91½ — 93½	..	4 5 7
Chelsea, Ord.	5	5	4†	4⅛ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	96 — 99	..	4 10 11
City of London, Ord.	10	8	9	16 — 17½	..	5 6 8
Do. 6 % Cum. Pref.	10	6	6	12 — 13	..	4 10 7
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 3 4
Do. 4½ % Second Deb. ..	100	4½	4½	100 —102	..	4 8 3
County of London, Ord... ..	10	6	6	10½ — 11	..	5 9 1
Do. 6 % Pref.	10	6	6	11⅝ — 12½	+ ⅛	4 18 0
Do. 4½ % Deb.	Stock	4½	4½	104 —106	..	4 5 0
Do. 4½ % Second Deb. ..	Stock	4½	4½	97 —100 xd	..	4 10 0
Edmundson's, Ord.	£3	Nil	..	1/16 — 1/8	+ 1/16	Nil
Do. 6 % Cum. Pref.	5	Nil	3	4⅛ — 4⅜	..	..
Do. 6% Non-Cum. Pref. ..	5	..	..	1⅛ — 2⅜	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	82½ — 85½	+1½	5 4 8
Folkestone	5	6	6	4⅜ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4⅜ — 5	..	5 0 0
Do. 4½ % First Deb.	100	4½	4½	90 — 92	..	4 17 10
Hove	5	9	9†	7¼ — 7⅞	..	5 16 2

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations May 13th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Kensington & Knightsbridge, Ord	5	9	8†	7⅞ — 7⅞	..	5 14 3
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	76 — 80	..	5 12 6
London Electric, Ord.	3	2½	..	1⅝ — 1⅞	..	4 0 0
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb. ..	Stock	4	4	91 — 94	..	4 5 1
Metropolitan	5	4	4†	3⅞ — 3⅞	..	5 6 8
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	98 —101	..	4 9 3
Do. 3½ % Mort. Deb.	Stock	3½	3½	82 — 85	..	4 2 4
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	99 —102	..	4 8 3
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	97½ —100½	..	4 19 6
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅞ — 10⅞	..	5 11 7
Oxford	5	7½	6†	5⅞ — 6⅜	..	5 13 9
St. James' and Pall Mall, Ord.	5	10	10†	8¾ — 9	..	5 11 1
Do. 7 % Pref.	5	7	7	6¾ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	84 — 87	..	4 0 6
South London, Ord.	4	5	6	2⅞ — 3⅛	..	7 7 8
Do. 5 % First Mort. Deb. ..	100	5	5	97 —100	..	5 0 0
South Metropolitan, 7 % Pref...	1	7	7	1 1/16 — 1 1/16	..	5 17 11
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 10 6
Urban, Ord...	£3	Nil	..	2⅛ — 2⅜	..	..
Do. 5 % Cum. Pref.	5	2	‡	2⅝ — 3⅛	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	83 — 86	..	5 2 3
Westminster, Ord.	5	10	10	8½ — 9	..	5 11 1
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5⅜	..	4 3 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5 — 5½	..	5 14 3
Calcutta, Ord.	5	8½	8½	6⅞ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Calgary Power, 1st Mort. Bds.	100	5	5	93 — 95	..	5 5 8
Canadian Gen. El. Com. ..	$100	7	7	115 —119	..	5 17 8
Do. 7 % Pref.	$100	7	7	119 —124	—1	5 13 0
Cordoba Lt., Power and T., Ord.	1	3	..	11/16 — 3/4	..	5 14 3
Do. 5 % Deb.	100	5	5	94 — 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 7 % Bonds	100	6	6	93½ — 95½	..	6 6
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	90 — 93	..	5 7 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	94 — 96	—1	5 4 1
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 3/16	..	Nil
Do. 6 % Pref.	1	6	6	1 5/16 — 2 3/32 xd	..	8 6 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	100 —102	..	4 18 0
Madras, Ord.	5	Nil	..	1⅜ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	103 —106	+1	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	81 — 84	..	5 19 1
Mexican Lt. & Power, Common	$100	4	4†	75 — 78	..	5 2 7
Do. 7 % Cum. Pref.	$100	7	7	101 —103 xd	..	6 16 0
Do. 5 % 1st Mort. Gold Bds.	..	5	5	91 — 93	— ½	5 7 6
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	81 — 84	..	5 19 1
Montreal, Lt., H. and Power ..	$100	8	9†	229 —234 xd	..	3 17 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	15 — 25 xd	..	..
River Plate, Ord.	Stock	10	..	217 —227	..	4 8 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	105 —110	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	100 —102	..	4 18 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital ..	$100	5	5	137½ —142½	..	3 10 2
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	101½ —103½	..	4 7 0
Toronto Power, 4½ % Deb.	Do.	4½	4½	99 —101	+ ½	4 9 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Victoria Falls Power, Pref. ..	1	11¼d.	17¾d.	13/16 — 15/16	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106 —108	..	5 11 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	6⅞ — 7⅜	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	97 — 99	..	5 1 0
American Telep. & Teleg., Cap.	$100	8	8†	132 —134	..	5 19 6
Do. Collat. Trust	$1000	4	4	92 — 94	..	4 5 1
Anglo-American Telegraph ..	Stock	8	8	64½ — 66½	..	4 10 3
Do. 6 % Pref.	Do.	6	6	110½ —112½	..	5 7 8
Do. Def.	Do.	80/-	30/-	23⅞ — 24⅜	— ¼	6 3 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	103 —105	+2	4 15 3
Chili Telephone	5	7	8	7 11/16 — 7 13/16	..	5 1 1
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	85 — 87	+1	4 12 0
Cuba Telegraph	10	6	6	8½ — 9½	..	6 6 4
Do. 10 % Pref.	10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	5	4	4†	8⅛ — 8⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6⅞ — 7¼	..	6 18 0
Direct United States Cable ..	10	5	4	6½ — 6⅞	— ⅛	5 18 6
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	135 —138	..	5 1 5
Do. 8½ % Pref. Stock.. ..	Do.	8½	8½	77 — 79	..	4 8 1
Do. 4 % Mort. Deb.	Dc.	4	4	94 — 96	..	4 3 4
Eastern Extension	10	7	7	13⅛ — 13⅝	..	5 2 7
Do. 4 % Deb.	Stock	4	4	95 — 97	..	4 2 6
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98½ — 100 ½xd	+ ½	3 11 7
Globe Telegraph and Trust ..	10	6	6†	10⅞ — 11⅛	..	5 6 8
Do. 6 % Pref.	10	6	6	12⅝ — 13⅛	..	4 11 4
Great Northern Telegraph ..	10	18	20	80 — 82	..	6 3 1
Indo-European Telegraph ..	25	13	13	59 — 61	..	5 6 7
Mackay Companies Common ..	100	5	5	83 — 86	..	5 16 3
Do. 4 % Cum. Pref.	$100	4	4	69 — 72	..	5 11 1
Marconi's Wireless Telegraph	1	20	..	4⅛ — 4⅜	— ⅛	4 11 4
Do. 7% Cum. Partic. Pref.	1	17	..	8⅝ — 8⅞	..	4 7 9
Monte Video Telephone, Ord. ..	1	5	6†	1 — 1⅛	..	5 6 8
Do. 5 % Pref.	1	5	5	⅞ — 1	..	5 14 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	97⅜ — 98⅝	..	4 11 2
Oriental Telep. and Elec. ..	1	8	10	1 7/16 — 1 9/16	..	5 3 5
Do. 6 % Cum. Pref.	1	5	6	1⅛ — 1⅜	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 8 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	+ ½	4 0 0
Reuter's	10	10	10†	11½ — 11⅝	..	8 12 0
Do. New Shares	10	..	..	10 11/16 — 11 13/16	+ 1/16	..
Submarine Cables Trust ..	Cert.	6	6	12⅛ —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	96⅓ — 98⅓	..	4 11 5
United River Plate Telephone	5	8	8†	7⅞ — 7⅞xr	..	5 8 6
Do. 5 % Cum. Pref.	5	5	5	5⅛ — 5⅜	..	4 9 0
West Coast of America	2½	2½	..	1⅛ — 1⅜	..	4 3 4
Do. 4 % Debs., 1 to 500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	+1	4 0 10
West India and Panama Teleg.	10	1½	1½†	2 1/16 — 2 3/16	+ 1/16	3 18 5
Do. 6 % Cum. 1st Pref. ..	10	6	6	10 — 10½	— ¼	5 14 3
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9⅞ — 10	..	6 0 0
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd. ..	10	7	7†	13 — 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	95 — 97	..	4 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	96 — 99	..	4 11 0

*Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. ‡ 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations May 13th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ⅝	..	Nil
Do. 5 % Pref.	1	5	5	15/16 — 1 1/16	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	72 — 77	..	5 17 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	8½ — 10½	..	..
Do. Do. Deferred	100	..	..	3½ — 5½	..	..
Do. Do. 6 % Cum. Pr't	100	6	6	83 — 86	..	6 19 6
Do. 7 % Non-Cum. Pr't.	100	..	..	32 — 35	..	..
Do. 5 % Perp. Deb.	100	5	5	88 — 92	..	5 8 8
Do. 4½ % 2nd Deb.	100	4½	4½	73 — 77 xd	..	5 17 0
Central London Railway, Ord.	100	3	3	82 — 84	..	‡4 15 3
Do. Pref.	100	4	4	84 — 86	..	‡4 13 0
Do. Def.	100	2	2	80 — 82	..	‡4 17 7
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
City & S. London, 5 % Pref., 1891	100	5	5	100 —102	..	4 18 0
Do. Do. 1896	100	5	5	100 —102	..	4 18 0
Do. Do. 1901	100	5	5	99 —102	+1	4 18 0
Do. Do. 1908	100	5	5	97 —100	..	5 0 0
Do. 4 % Deb.	100	4	4	91 — 93	..	4 6 0
Great Northern & City, Pr't. Ord	10	Nil	Nil	2¼ — 2½	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	7/8 — 1	..	7 7 8
Do. 4½ % Deb.	100	4½	4½	66⅞ — 71⅞	..	6 5 5
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2¼ — 2⅝	..	4 15 3
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Lancashire United, 5 % Deb.	100	5	5	78 — 80	..	6 5 0
London Elec. Railw'ys, 4 % Deb.	100	4	4	94 — 96	..	4 3 4
London United Trams, 5 % Pref.	10	Nil	..	4½ — 5	..	..
Do. 4 % Deb.	100	4	4	62 — 66	—1	6 1 3
Metropolitan Railway Consol.	100	1⅞	1⅝	52½ — 53	+1½	3 1 4
Do. Surplus Lands	100	2⅜	2⅜	62 — 64	..	4 6 0
Do. 3½ % Deb.	100	3½	3½	86 — 87	..	4 0 6
Do. 3½ % Pref.	100	3½	3½	83 — 85	+1	4 2 4
Do. 3½ % Con. Pref.	100	3½	3½	81 — 83	+1	4 4 4
Metropolitan District Ord.	100	Nil	Nil	39½ — 40	..	Nil
Do. 6 % Deb.	100	6	6	139 —141	+1	4 5 1
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Do. 4 % Prior Lien	100	4	4	97 — 99	+1	4 0 10
Do. 4½ % First Pref.	100	4½	4½	85 — 87	..	5 1 9
Do. 3½ % Gtd.	100	3½	3½	75 — 77	..	4 10 11
Metropolitan Elec. Trams, Ord.	1	6	5½	27/32 — 31/32	..	5 14 7
Do. 6 % Pref.	1	6	6	1 1/16 — 1 1/8	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	87 — 91	..	4 18 11
Do. 5 % Deb.	100	5	5	91½ — 94½	..	5 5 10
Potteries, Ord.	1	3½	..	1 3/16 — 1 7/16	..	..
Do. 5 % Pref.	1	5	5	31/32 — 1 1/32	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3
South Metro. Trams, 6 % Pref.	1	6	..	1 1/4 — 1 3/8	..	7 7 8
Do. 4 % Deb.	100	4	4	65 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	4 3/32 — 4 5/32	+ 1/8	Nil
Do. "A"	1/-	..	..	31/32 — 1 1/32	..	Nil
Do. 6% First Cum. Inc. Deb.	100	..	6	109 —111	..	5 7 8
Do. 4½ % Bonds	100	4½	4½	97 — 99	..	4 10 11
Do. 6 % Income	100	1½	6 †	22 — 23	..	6 9 0
Yorkshire (West Riding), Ord.	5	Nil	..	1/4 — 3/8	..	Nil
Do. 6 % Pref.	5	3	3†	3 3/8 — 3 7/8	+ 1/8	3 17 5
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4 13/16 — 5 1/16	..	5 8 7
Do. 2nd Pref.	5	5½	5½	4 3/16 — 4 5/16	..	5 14 3
Do. 4 % Deb.	100	4	4	80½ — 82½	..	4 6 6
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	99 —101	..	4 19 0
Auckland Trams, 5 % Deb.	100	5	5	101 —103	..	4 17 1
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11½	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	96 — 98	..	4 11 10
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	..	6†	96 —98 xd	— ½	6 2 10
Brisbane Trams Invt., Ord.	5	8	8†	7½ — 7¾	..	5 5 0
Do. 5 % Pref.	5	5	5	4 7/8 — 5 1/8	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
B. Columbia Elec. Rly., Def.	100	8	8†	131 —134 xd	..	5 19 5
Do. Pref. Ord.	100	6	6	114 —117	..	5 2 7
Do. 5 % Pref.	100	5	5	103 —106	..	4 14 4
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —102	..	4 8 8
Do. 4½ % Con. Deb.	100	4½	4½	94½ — 96½	..	4 8 1
Calcutta Trams, Ord.	5	7	5†	5 5/8 — 6 1/8 xd	..	5 14 3
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 17 7
Do. 4½ % Deb.	100	4½	4½	97½ —100½	..	4 9 7
Cape Electric Trams	1	2½	..	1 1/4 — 1 3/8	..	..
City Buenos Aires Trams (1904)	5	5	5†	5 5/8 — 5 7/8	..	4 10 0
Do. 4 % Deb.	100	4	4	95 — 99	..	4 0 10
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½ xd	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	97 —101	..	4 19 0
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % A Deb.	100	5	5	83 — 88	..	5 13 8
Do. 6 % B Deb.	100	6	8	25 — 35	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	15/16 — 1 1/32	..	..
Do. Pref.	1	6	..	1 1/16 — 1 1/16	..	5 13 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 1/8 — 1 3/8	..	4 7 3
Do. 6 % Pref.	1	6	6	1 — 1 1/4	..	4 16 0
Do. 5 % Deb.	100	5	5	92 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	103 —105	..	4 15 3
Manaos Trams & Lt., 1st Deb.	100	5	5	88 — 91	+1	5 10 0
Manila Elec. R. and Ltg., Bonds	$1000	5	5	97 —100	..	5 0 0
Mexico Trams Com.	$100	7	7†	106 —108	—1	6 9 8
Do. Gen. Con. 5 % Bonds	..	5	5	91½ — 93½	..	5 7 0
Do. 6 % Bonds	100	6	6	97½ — 99½	..	5 0 7
Para Elec. Rlys. & Lt., Ord.	5	10	10	6¾ — 7⅛	— ⅛	6 15 7
Do. 6 % Pref.	5	6	6	4 3/8 — 5 1/8	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	100 —102	..	4 18 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1 3/16 — 1 1/4	..	3 14 5
Do. 5 % 1st. Deb.	100	5	5	105 —108	..	4 12 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 5⅝	..	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	..	4 10 11
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	102 —103	..	4 17 0
Do. 5 % Mort. Bonds	100	5	5	95½ — 96½	— ½	5 8 8
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	100½ —103½	..	4 16 7
Singapore Trams, 5 % Deb.	100	5	5	88½ — 87½	..	5 14 3
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	6†	4 7/8 — 5 1/8	..	6 10 3
Do. 6 % Pref.	5	6	6	4 3/4 — 5 1/8	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	96 — 99 xd	..	5 1 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	3/4 — 7/8	..	8 0 0
Do. 6 % Pref.	1	6	6	2 3/4 — 2 7/8	..	7 2 2
Babcock & Wilcox	1	28	16	3 — 3 1/4	..	5 2 6
Do. Pref.	1	6	6	1 3/4 — 1 7/8	..	6 3 6
British Aluminium, Ord.	1	Nil	..	1/2 — 9/16	..	..
Do. 6 % Cum. Pref.	1	Nil	6	3/4 — 7/8	..	5 17 2
Do. 5 % Prior Lien Debs.	100	5	5	98 — 99	..	5 1 2
Do. Deb. Stk.	100	5	5	84 — 87	..	5 14 11
B.I. & Helsby Cables	5	10	10	7¾ — 8	..	6 5 0
Do. Pref.	5	6	6	5 3/4 — 6 1/4	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	96 — 98	..	4 11 10
British Westinghouse, Pref.	8	Nil	Nil	1/4 — 3/8	..	Nil
Do. Deb.	100	4	4	64 — 68	+1	5 17 8
Do. 6 % Prior Lien	100	6	6	98 —101	..	5 18 10
Browett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	4/6 — 5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — 1/4	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	73 — 78	..	6 8 2
Do. 4½ % Deb.	100	4½	4½	88 — 48	..	10 9 4
Do. 4½ % Second Deb.	100	4½	4½	25 — 29	..	16 13 4
Callender's Cable	5	15	10†	11½ — 12½	..	6 2 5
Do. Pref.	5	5	5	4½ — 5½	..	4 17 7
Do. Deb.	100	4½	4½	98 —101	..	4 9 1
Castner-Kellner	1	20	20	3½ — 4	..	5 0 0
Do. Deb.	100	4½	4½	103 —106	..	4 4 11
Crompton & Co.	8	Nil	..	1/8 — 1/4	..	Nil
Do. Deb.	100	5	5	55 — 57	..	9 15 6
Dick, Kerr	1	5	Nil	1/16 — 1/8	..	..
Do. Pref.	1	6	6	3/16 — 5/16	..	7 18 10
Edison & Swan, A, £8 paid	5	Nil	..	1/16 — 1/16	— 1/16	Nil
Do. fully paid	5	Nil	..	1/8 — 1/4	..	Nil
Do. 4 % Deb.	100	4	4	60 — 64	—1	6 5 0
Do. 5 % Second Deb.	100	5	5	70 — 73	..	6 17 0
Electric Construction	2	2½	2½	1 3/16 — 1 5/16	..	5 14 4
Do. Pref.	2	7	7	1 3/4 — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7½ — 8	..	8 5 8
Do. Deb.	100	5	6	92 — 94	..	5 4 2
General Electric, 6 % Pref.	10	6	6	10 — 10½	..	5 11 7
Do. Deb.	100	4	4	88 — 92	..	4 6 0
Henley's, Ord.	5	15	15	12½ — 13	+ ⅛	5 15 5
Do. Pref.	5	4½	4½	4 3/4 — 5	..	4 10 0
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	..	7½	11 — 12	..	6 5 0
Do. Pref.	10	5	5	9 — 10	..	5 0 0
Telegraph Construction	12	17½	20	36 — 38	..	6 6 2
Do. Deb.	100	4	4	96 — 99	..	4 0 10
Willans & Robinson	1	Nil	..	1/16 — 1/8	..	Nil
Do. Pref.	5	Nil	..	1/4 — 3/4	..	Nil
Do. Deb.	100	4	4	57 — 59	..	6 15 7

Unless otherwise stated, all share are fully paid. † Interim dividend. ‡ Dividend of 4 per cent. guaranteed by Underground Electric Railways.

Bank rate of Discount 4½ per cent., April 17th, 1913.

NEW WORKS OF THE CIE. PARISIENNE DE DISTRIBUTION D'ÉLECTRICITÉ.

On March 21st, 1907, the Union des Secteurs of Paris was first given official recognition, and on January 1st, 1914, the Cie. Parisienne de Distribution d'Electricité absorbs the six existing supply companies. The onerous conditions on which its concession has been granted include payment of 10 per cent. per annum of the gross receipts (nominally as rental for that part of the distributing system belonging to the municipality), with a sliding scale increasing this rent, the minimum annual payment being £120,000. The whole property will be taken over by the municipality in 1940 without payment, or in 1924 on payment of the balance not then provided for by the statutory sinking fund. The authorised tariffs are 4·8d. per unit for lighting and 2·9d. for power.

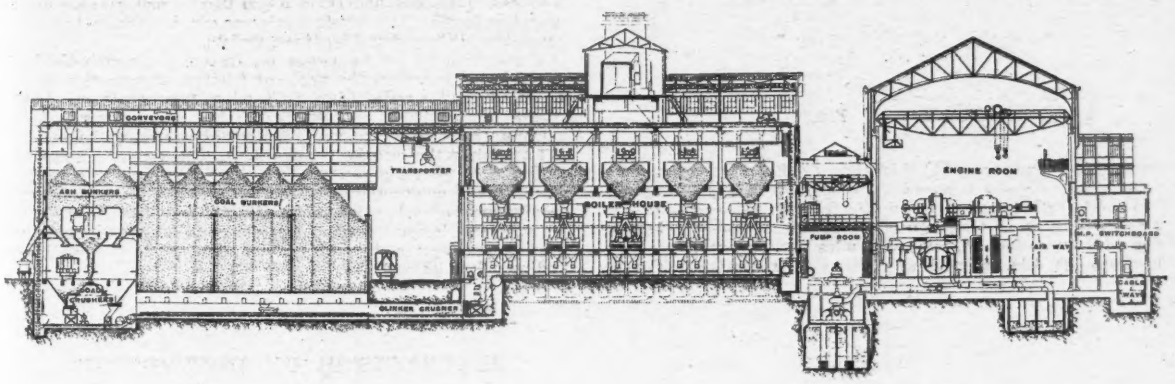


Fig. 1.

A further condition stipulated was that two generating stations be erected, one in the north, the other in the south-west of Paris, both being on the banks of the Seine and interconnected electrically. These works are now practically completed, and from a detailed description in *La Technique Moderne*, we draw the following particulars.

Usine Nord (Northern Station).

This station, situated at St. Ouen les Docks, covers an area of 3·21 acres, and is at present of 50,000 kw. rated capacity; the ground occupied and the kw. capacity will be doubled by the extensions ultimately contemplated. The special features of the various divisions at the station are as follows:—

The works are connected to the Seine by a viaduct terminating on a pier which carries a coal and ash-handling equipment. Coal and ashes are taken to and from the boiler house by an electric loco. capable of hauling 100 tons at 5½ m.p.h. on the level, and provided with a drum winch at one end. Each boiler house is provided with a double set of bunkers, each of which contains three coal divisions and accommodates 5,000 tons of fuel. The coal and ash bunkers are filled and emptied by a system of conveyors, transporters and motor hoppers (see fig. 1). Conveyors and electric transporters are used to distribute coal from the bunkers as required. A system of water pipes is laid to enable the bunkers to be flooded in case of spontaneous combustion.

Boilers.—Two groups of boilers, separated by a lane 33 ft. in width, comprise respectively 10 Belleville, 10 Babcock and 20 Babcock boilers. The groups of 20 are arranged in rows of five on either side of a firing aisle and the feed-purifying plant is between the two boiler houses each of which is 145 ft. square. Each boiler provides 22,000 lb. of steam per hour (or 31,000 lb. on overload), at 228 lb. pressure per sq. in. and superheated to 620° F. to 700° F. The economisers are placed above each boiler and, like the latter, are totally enclosed by steel plates lined with diatomite and refractory bricks. The flues (5 mm. sheet lined with diatomite and refractory brick) from each set of boilers are led to a common stack mounted over the firing aisle. The smoke stacks (four in number), are of reinforced concrete 16 ft. 5 in. in internal diameter and rise 186 ft. above the grate level.

The feed pumps for the Belleville boilers at Usine Nord are of the horizontal multi-cellular five-disk Neumann centrifugal type, coupled to motors.

Low and medium-pressure pumps are installed to supply reserve tanks and to clean the circulating water galleries.

Circulating Water Supply; Pump Room.—Below the pier on the river front is an intake chamber for the circulating water supply; this chamber is protected by a coarse grill of stationary trapezoidal bars, cleaned by a special rake, and by two movable galvanised iron screens of fine mesh. The latter are driven electrically, and, when raised, pass through a pressure jet of water which cleans them. The intake conduits can be shut off from the intake chamber in case of need. The incoming water passes into two large chambers below the pump room whence it is drawn by the circulating pumps. After leaving the condensers the water flows into two chambers parallel to the first and returns to the Seine through a quadruple subterranean gallery. Reservoirs above the pump room contain the water required for general works purposes.

Power House.—The power house (482 ft. × 85 ft.) is spanned by two 50-ton electric travelling cranes and accommodates eight 10,000-15,000 kw. turbo-alternators and three 750-kw. converter sets for station and auxiliary supply. Further particulars of this equipment are promised for a later date.

Switch House.—The switch house (33 × 45 ft.) opens out from the power house, into which the main control balcony projects, with the alternator and feeder-control panels in arcs of circles. The two main switchboard storeys are surrounded by offices, and the outgoing high-tension sub-station feeders are carried in galleries below the switch house. The eight turbo-alternators at present installed are connected to 32 outgoing feeders through two sets of bus-bars, so arranged that either of the two groups of alternators can supply all the feeders if required (see fig. 2). Normally, the two sets of bus-bars are disconnected by a remote-control isolating switch. Each alternator is protected by a continuous-flow liquid pressure discharger and a reverse current cut-out connects the machine to a special group of bars, thus forming a "bridge" of machines, which can be connected to one or other of the two main bus-bar systems by maximum cut-outs with time relays.

The high-tension feeders, each of 4 × 100 sq. mm. section, are connected to the bus-bars in groups of four. Each feeder is provided with maximum cut-outs, and the bridge connections for each group of four feeders contain two further maximum cut-outs. Between each feeder and earth is connected a Wurtz arrester, with carborundum resistances in series. The alternator cut-outs are designed for 800 amperes and the feeder cut-outs for 200 amperes; a double break (16 in.) is arranged on each pole, so that each cut-out (8 ft. 6 in. × 3 ft. 3 in. × 10 ft. 9 in.) comprises four distinct unipolar elements.

The low-tension station circuits are supplied at 210 volts from the four 750-k.v.a. converters and two 3,000-ampere-hour accumulators. In conjunction with the latter is used a double 2,000-ampere 22-step horizontal regulator, electrically-controlled from the low-tension board.

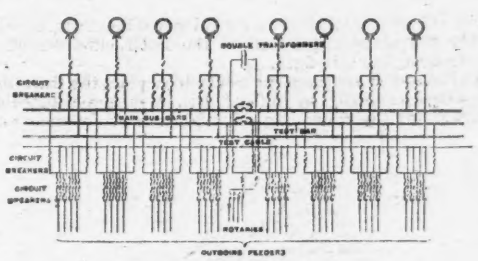


Fig. 2.

The alternator excitation may be controlled by hand or by automatic Orutin regulators. A maximum voltage relay is included in each regulator circuit, to prevent an indefinite increase in the alternator voltage should a cut-out operate, and a maximum current relay is also provided to suspend the action of the regulator in case of short-circuit.

To enable load tests on the alternators to be made, a special system of bus-bars is provided, to which each machine can be connected (as shown in fig. 2), and thus placed on a water load capable of absorbing 15,000 k.v.a. at 12,300 volts. No feeder is connected to the main bus-bars till it has been subjected to full working pressure by a variable transformer connected to the feeder-test bus-bars.

Usine Sud-Ouest (S.W. Station).

This station is at Issy les Moulineaux, occupies a site of 5·3 acres in area, and is of 25,000 kw. present, and 50,000 ultimate capacity. As regards its general arrangement and the provision made for water supply and distribution, the works much resemble the Usine Nord. Coal and ashes are carried between the station and a 130 ft. × 46 ft. quay on the Seine, by a bucket conveyor installed in a subway below the Rue Bara. Ten Belville and ten

Babcock boilers flank two firing aisles in a single boiler house, and the power house (220 ft. × 85 ft.) contains three turbo-alternators and three 500-converter sets.

Station Buildings, Foundations, &c.—In both stations the buildings are almost entirely of reinforced concrete construction, and some of the main beams carried by the steel skeleton pillars are 4 ft. 3 in. in height. The circulating water galleries have concrete walls, more or less strongly reinforced according to the size of the gallery and the load carried.

The foundations of the main building pillars, alongside the circulating water galleries, were subject to a very much higher

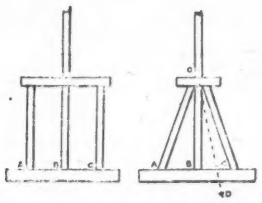


FIG. 3. FIG. 4

pressure (2·3 tons per sq. ft.) than those of the galleries, hence the foundations had to be independent, though so closely contiguous. It was originally intended to carry the foundations on piles, but the urgency of the work forbade adoption of this method—in anticipation of the use of which, reinforced piles had already been made. Footings 4 ft. 6 in. in width were placed in excavations at the side

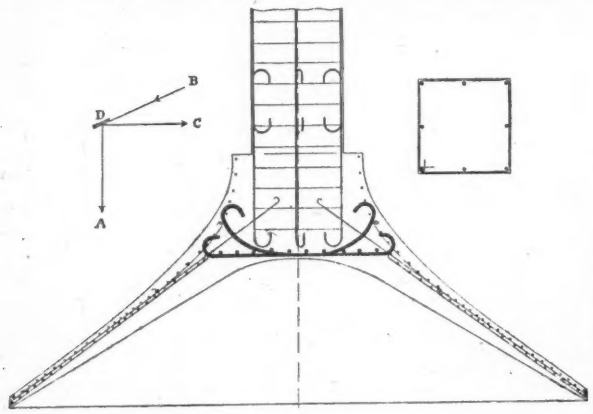


FIG. 5.

of the galleries; each footing carried one column and, to distribute evenly the concentrated load of the latter, cut-down piles were arranged as shown in fig. 4.

An alternative arrangement would be to place the three distributing pillars vertically, as in fig. 3, but, in such a case, the unequal resistance of the underlying soil might ultimately remove all load

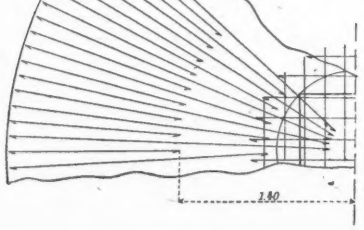


FIG. 6

from, say, pillar A. The pillar C would then be unable to offer any useful support, and the whole load would be concentrated on B, probably disastrously. On the other hand, in the case represented by fig. 4, should A fail, the pillars B, C, would still offer their maximum support, the resultant reaction being in the direction O D. The general flooring of the works would be able to supply the horizontal reaction required to establish equilibrium (this reaction being small owing to the small inclination of C), and the load on B, C, would be increased about 50 per cent., as compared with a treble loading of B in the case represented by fig. 3.

At the Usine Nord, the boiler houses and silos stand on a good gravel, capable of carrying heavy loads, but for safety the bearing pressure was limited to 2·25 tons per sq. ft. To distribute the pressure from the less heavily-loaded pillars, ordinary foundation plates were used, but those pillars more heavily loaded were mounted on a special footing, designed by Considère & Pelnard, which has recently been employed in the naval yards at Havre and the magazines at Alexandria. Using the ordinary type of foundation, those boiler house pillars carrying 625 tons would have required foundation plates 270 sq. ft. in area formed of heavy radial ribbing, cross-connected by a secondary reinforcement and resting on a common foundation block. This type of foundation is costly in materials and labour, and, in it, load is concentrated on the reinforcing members, and the high shearing stresses set up require the use of numerous stirrups.

The Considère & Pelnard foundations actually used consist of hollow reinforced cones (fig. 5) resting on mounds of virgin earth trimmed to shape and covered with a preliminary thin layer of cement, the function of which is to preserve the underlying earth from deformation during the subsequent stages of erection. On the mound thus prepared is laid a set of rings (or a conical spiral terminating in large hooks), which is tied to rods running up the cone (see fig. 6). The whole reinforcement is then embedded in concrete and the pedestal itself is complete.

The inclination of the generating lines of the cone to the horizontal being less than the angle of friction, the reaction of the underlying soil is vertical (D A, fig. 5, where D represents an element of the pedestal cone). This reaction resolves into a compression D B taken up by the concrete and a horizontal component balanced by the tension in the circular or spiral bars. The concrete is nowhere subjected to shearing, or any other stress than pure compression, along the generating lines of the cone, and the circumferential reinforcement is subject to pure tensile stresses which do not destroy its adherence to the cement. It is claimed that these foundations effect from 20 per cent. to 35 per cent. economy as compared with ordinary foundation plates.

PROCEEDINGS OF INSTITUTIONS.

The "Point Fives."

THE following is an abstract of the chairman's address at the meeting held at Bradford on April 18th, 1913 :—

In Bradford considerable headway has been made in connection with the heating and cooking supply, more especially the former, and this has been almost solely due to the fact that a tariff under which current may be obtained by domestic consumers for such purposes at ½d. per unit, has been in existence since July 1st, 1910. Electric heaters are extremely popular with consumers who have adopted the special domestic tariff, and a small number of complete electric cooking outfits are in use. No scheme, however, is in existence under which consumers can obtain such outfits on hire, as the types of cookers which have up to the present been put on the market have not proved altogether suitable for local requirements, more especially in connection with the baking of bread. For this reason, also, consumers have not been recommended by the department to purchase such cookers outright. In view of the prices at which heaters can now be obtained it appears to be hardly necessary to inaugurate a hiring scheme in order to popularise their use.

Up to March 31st last, the total number of private residences in Bradford in which electricity was in use was 918, and out of this number the occupiers of 471, or 51·3 per cent., had adopted the Special Domestic Tariff of 15 per cent. per annum upon the net rateable value of the premises occupied, plus one-halfpenny per unit for all current consumed as registered by meter, no charge being made for the hire of the latter. When giving consideration to the framing of a special charge for domestic purposes, the accounts of all the private house consumers connected to the mains were totalled, and particulars of the rateable value of each of the premises obtained. It was then found that if the whole of such consumers were charged at the rate of 3s. in the £ on their net rateable values, plus ½d. per unit for all current used, the total revenue obtained from them would be practically the same as was then being obtained under the flat rate of 4d. per unit, less 2½ per cent. discount for prompt payment. The effect of such a tariff on consumers individually was, of course, found to vary considerably. It was, however, generally found that the consumers who would benefit by the new tariff had wired their houses for electric light throughout, whereas those who would not benefit by the rate had only wired the best rooms. It was extremely satisfactory to find that on inauguration of the rate, not only was it adopted by consumers who would immediately benefit, but a number of consumers who would only benefit by adding to their installations also made application to be charged on the new system.

The feature which seems to have proved most attractive to such consumers and to consumers who have since been obtained, is that it is possible to ascertain definitely within a few shillings the exact amount of one's bill for electric lighting, as it is impossible for the amount to vary to any considerable extent by reason of carelessness on the part of members of the household in leaving lights burning at times when rooms are not in use. Practically all the consumers who have adopted the rate have very considerably increased the illumination of their premises, and in many cases the increase has been as great as 100 per cent. This has had the effect of removing the reproach which was often flung out to the effect that houses in which electric light was in use were illuminated very much worse than those in which incandescent gas was the illuminant.

PARTICULARS OF INSTALLATIONS, ACCOUNTS, &c., OF VARIOUS CONSUMERS IN BRADFORD.

Lamps installed.		Other apparatus.		Total KW.	Rateable value.	Accounts for year ended December 31st, 1912.			Remarks.
No.	KW.	Nature.	KW.			Units.	Rate.	Amount.	
27	1·10	1 cooker: 4 1,000-watt radiators, 1 vacuum cleaner, on 8 10-ampere plugs	10·0	11·10	30	—	15 %	£4 10 0	
						3,940	½d.	8 4 2	
								£12 14 2	= ·77d. per unit.
22	·97	1 cooker, 2 radiators, 2 6-lb. irons, 1 boiler, on 6 10-ampere plugs	13·8	14·77	31	—	15 %	£2 6 6	For half-year ended Dec. 31st, 1912, only.
						1,162	½d.	2 8 5	
								£4 14 11	= ·98d. per unit.
17	·79	1 iron	·66	1·45	(21)	153	4d.	£2 11 0	
								0 1 3	Less discount.
								£2 9 9	
								0 11 5	Hire of meter.
								£3 0 2	= 4·72d. per unit.
19	·776	1 4-light radiator: 1 8-lb. iron, 1 sewing machine motor	2·26	5·036	18	—	15 %	£2 14 0	
						412	½d.	0 17 2	
								£3 11 2	= 2·07d. per unit.
23	1·24	Radiators, convector, hot-plate, &c.	3·45	4·69	25	—	15 %	£3 15 0	
						1,936	½d.	4 0 7	
								£7 15 7	= ·96d. per unit.
THE LOWEST ASSESSED RATEABLE VALUE CONSUMER:—									
0	·43	1 4-light radiator	1·15	1·58	7½	—	15 %	£1 2 6	
						373	½d.	0 15 7	
								0 2 6	Added to June half-year s/c., to bring amount to cover minimum charge.
								£2 0 7	= 1·30d. per unit.

Up to December 31st last the total capacity of the heating and cooking apparatus which was known to have been connected to the Bradford mains exceeded 1,000 KW., and there are undoubtedly very considerable numbers of radiators, irons, &c., in use on the system which are not included in the above figures, but only appear in the department's books as 5 or 10-ampere plugs.

With all respect to my fellow-members of "The Point Fives," who have adopted a special flat rate of ½d. per unit for heating and cooking purposes, I submit that the majority of consumers (at any rate, of those in Bradford) supplied on the "Norwich" system with ½d. per unit as the running charge, are in a far more favourable position than if they were charged at one price for energy used for lighting purposes and on a ½d. per unit flat rate for heating and cooking. They have the advantage of only having one meter and one system of wiring, and can increase the candle-power and number of lamps in use to any desired extent without incurring a much larger charge for the additional energy required.

The percentage to be paid on the net rateable value as a standing charge must be worked out separately for each supply area, as it is quite within the bounds of possibility that 10 per cent. on a particular house in one area may represent a considerably larger sum than 15 per cent. in another area, for a house of exactly similar size. In London or Glasgow, for instance, the rateable value of a comparatively small flat would, I feel sure, exceed that of a fair-sized house in Bradford, although the light required in such a flat would be considerably less than in the case of a house.

The following statement gives particulars regarding the maximum demands and consumptions for the half-year ended December 31st, 1912, of 28 consumers charged on the rateable-value system, on whose premises demand indicators had been fixed. The net rateable values of these consumers' residences vary from £16 10s. to £150:—

Kilowatts of connections...	107
Combined maximum demands as per indicators ...	74 KW.
Units used during half-year ended December 31st, 1912	22,543
Average units per consumer for half-year	805
Average units per kilowatt installed for half-year ...	211
Load factor	6·95%
Average price per unit	1·65d.
Equal to a charge of £2 18s. 4d. per annum per kilowatt, plus ½d. per unit.	
Average price per unit if charged on maximum-demand rate of 7d and 1d.	4·26d.

Economies in the Use of Electric Power.

By W. E. MILNS.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *at Birmingham, February 26th*, 1913.)

TECHNICAL knowledge is necessary in order to secure efficiency and economy. The electric motor is not suitable for every class of work, and in certain cases it should not be recommended, for commercial reasons. Technical knowledge and practical experience are required to determine these cases. The commercial canvasser who, lacking any technical knowledge, possesses those qualities of salesmanship which enable him to get motors into consumers' premises, is a dangerous person to employ.

The author cannot too strongly emphasise the importance of technical advice in arranging an electric drive. Considering the many types of electric motors and the great variety of control gear, it is a pity that the shunt motor with an ordinary starting switch is apparently used on every possible occasion. Technical knowledge is also essential in handling alternating-current work.

The heaviest item in a manufacturer's expenses is usually the wages bill. The power arrangements should therefore be designed to affect the wages account rather than the power account. A well-thought-out power scheme will often increase the output for the same wages bill (this is equivalent to a reduction in a wages bill); and it will also cut down the manufacturer's expenses by saving material, reducing the floor space occupied, and minimising wear and tear and other maintenance charges. To design a successful power scheme for a works, the engineer must have some knowledge of the trade or manufacture carried on in those works. The works manager or works engineer is a most valuable ally, and much information can often be obtained from him.

The author does not advocate that the most efficient mechanical arrangements should be installed regardless of cost. The subdividing of shafting and the individual driving of machines will occasionally reduce current consumption, but the capital cost of such arrangements cannot always be justified. It is sometimes cheaper to consume a little more current and save capital outlay than to introduce expensive mechanical alterations. Each case must be decided on its merits.

Too much importance is attached to the cost of power, and it is also difficult to get a manufacturer to realise the many considerations which are put forward when comparing estimates for the cost of driving. The power user is usually told that, say, a 10-H.P. gas engine takes 20 cb. ft. of gas per horse-power-hour. On a 50 hours per week basis, this works out at 10,000 cb. ft. of gas, which, if charged at 1s. 6d. per 1,000 cb. ft., equals 15s. On the other hand, the customer is told that a 10-H.P. motor consumes approximately 1 unit per horse-power-hour, which is equivalent to 500 units per week. Taking current at 1d. per unit, he is thus shown that the electric motor would cost 41s. 8d., against 15s. for a gas engine.

Such comparisons are considered seriously by a man who has been fairly satisfied with gas engines, and who is entirely ignorant of electric driving. Of course, one may usually point out the gross unfairness of such comparisons, which omit a number of very heavy charges. It can also be shown that the saving in shafting losses reduces the horse-power-hours, and that the splitting up of drives reduces the number of running hours, and all the other practical arguments of the superiority of electric motors over gas engines can be brought forward. It is, however, in most cases difficult to put an exact value on these advantages, and the power user asks for more definite figures than a theoretical calculation based on either his maximum possible output or his estimated average load.

A method of estimating the cost of driving based on figures actually obtained from existing manufacturers' installations gives

a more common-sense and accurate comparison, and the figures can be backed by the evidence and results obtained from several years' working on various drives.

For the benefit of power users and engineers engaged in developing power loads, the author gives some figures obtained from the analysis of power costs in various trades. The figures given show the number of units used per annum per horse-power installed, the figure being the average of a number of manufacturers in the same class of business. The installed horse-power is such as is usually found in a factory where a little margin is allowed for development and extra load.

ELECTRICAL ENERGY USED IN VARIOUS TRADES.

Trade.	No. of units per annum per H.P. installed.	Trade.	No. of units per annum per H.P. installed.
Bakers and confectioners	427	Leather-workers	730
Bedstead manufacturers...	613	Metal-workers	672
Boot manufacturers ...	591	Opticians	354
Brassfounders	927	Paper box manufacturers	362
Brewers	689	Paper manufacturers ...	67
Brush manufacturers ...	454	Pen manufacturers ...	378
Builders	189	Photographic purposes ...	940
Butchers	278	Polishers	744
Button manufacturers ...	570	Printers	569
Chemists (manufacturing)	1,699	Printers (newspapers) ...	833
Organ blowing	246	Provision merchants ...	408
Clothiers	938	Public offices (fans) ...	2,766
Cold storage	3,217	Public offices (lifts) ...	352
Corn merchants	267	Refiners	515
Die-sinkers	188	Rolling mills	486
Electroplaters	546	Surgical and dental purposes	353
Engineers (cycle)... ...	987	Stampers and piercers ...	592
Engineers (general) ...	917	Upholsterers	167
Glass manufacturers ...	470	Vacuum machine companies (manufacturers)	371
Gunmakers	647	Varnish manufacturers ...	382
Hairdressers	178	Woodworkers	453
Ironfounders	781	Wireworkers	1,091
Jewel-case makers ...	893	Whip manufacturers ...	95
Jewellers	775		
Lamp manufacturers ...	1,331		
Laundries	421		

Actual comparisons of the cost of gas, steam and electric driving on the same work are given below. These figures have been obtained from manufacturers who previously used steam power and afterwards electricity, the work done in no case being less with electric driving than in the case of steam driving.

Horse-power installed.	Cost of driving by steam.	Cost of driving by electricity.
1,387	£6,000	£4,000
200	1,680	1,476
80	750	504

The following figures have been obtained from installations previously driven by gas plant operated with gas from town mains :—

H.P. installed.	Cost of driving by gas.	Cost of driving by electricity.
25	£130 0 0	£104 0 0
5	33 9 0	23 9 7
40	156 0 0*	144 6 10

* Suction gas plant.

The following interesting example is from a large pen factory, the owners of which have taken very careful tests on the cost of steam, town gas, suction gas and electricity. The H.P. installed was 250. The cost of steam driving with Corliss compound condensing engines is £9 10s. per H.P. per annum ; with gas from the Corporation mains, at 1s. 5d. per 1,000 cb. ft., £7 4s. 2d. per H.P. per annum : and with suction gas, £4 17s. 3d. per H.P. per annum. The cost of electric driving with current at 1d. per unit came to £3 13s. 9d. per H.P. per annum.

The above typical examples take into account maintenance, wages and repairs, while the example from the pen factory also takes into account interest, depreciation and all other charges.

Another method of comparison which will appeal to a manufacturer with an elementary knowledge of engineering is to obtain load curves for the steam engines by means of continuous recorders, or from electric motors by means of recording ammeters, and to submit such curves to a power user.

The owner of a rolling mill, which was steam driven, assured the author that the large number of rolls on his engine resulted in a practically steady load, so that the engine was worked at a very high efficiency throughout its run. He argued that under such conditions electricity could not compete with steam engines on the ground of cost. A continuous indicating diagram, however, showed that his load varied from 70 to 215 H.P.

Speed curves are also of considerable value. The steam engine falls to its lowest speed at the money-earning period. The fall of speed in the electric motor is much less than with the steam engine, so that the output and revenue are much increased. Diagrams may also be used to emphasise the saving in floor space.

The manufacturer too often considers the uses of electricity from a power standpoint only. The many other uses which can be made of the supply are often of considerable convenience and value to him. Efficient lighting has a direct influence on output. Evidence of this is found not only in the lighter trades, in pen factories, in the jewellery district, &c., but also in the heavier work of rolling mills, casting shops, &c. Again, the uses of electricity for small portable apparatus are often of considerable value. Electric heating, welding, smelting, &c., offer peculiar advantages in certain trades.

In conclusion, the advocate of electric driving need not hesitate conscientiously to put forward his schemes. He stands for a system which all arguments and experience have proved to be so far the most ideal and perfect power in use.

A further and last argument, which, unfortunately, is rarely taken into consideration, is that the conditions of labour and employment in electrically-equipped factories are usually far superior to those found in works utilising any other form of power.

DISCUSSION.

MR. N. B. ROSHER explained a method of checking the power costs adopted by a firm with which he was connected. They took the ratio of the total expenditure on power and fuel to the total sales. Thus in 1907, when the works were entirely driven by gas engines, the ratio was '83 ; but in 1910, when the conversion to electric driving had been completed, the ratio dropped to '74, or a decrease of approximately 12 per cent., due to electric driving, and this notwithstanding the fact that a considerable increase had taken place in the number of machines driven by power. About six months ago a sheet metal rolling mill driven by a horizontal condensing steam engine was converted to electric driving. The saving in running costs since the conversion had been so great that the whole of the electrical outfit, including cost of foundations, &c., would be paid for in two years by the saving effected.

MR. W. FENNELL said he had found the best means to convince a sceptical power user of the economy of electric driving to be a trial, taking one part of the works which could be easily isolated. In two cases he arranged for the hire, with option of purchase, of the equipment of quite large works, one of them taking about 400 H.P. He took the risk of cost of service, &c., and of temporary wiring. In both cases he convinced the intending consumers that electric driving would save them money. With regard to the damage done by irresponsible and unskilled arrangements, they made it a point at Wednesbury to get in touch with works users in the early stages, and in those cases where the work was not in the hands of specialists, they gave advice and kept more or less control of the arrangements from start to finish. He always made it clear that he took no moral responsibility for results where he was not consulted.

Faraday Society.

GENERAL DISCUSSION ON THE CORROSION OF IRON AND STEEL.

AT their April meeting, the Faraday Society met at Manchester, combining forces with the Local Section of the Society of Chemical Industry. A group of papers was presented dealing with the electrochemical aspects of the corrosion—and its prevention—of iron and steel, and a long and interesting discussion followed the reading of the papers.

MR. BERTRAM LAMBERT, M.A., put forward "An Electrolytic Theory of the Corrosion of Iron," which is claimed to be a simple and natural development of the ideas of Faraday on electrolysis. Everybody knows that commercial zinc dissolves freely in diluted acid, because the impurities in the metal set up ever so many minute voltaic cells, in which the zinc is the positive element, and so goes into solution through the action of the innumerable local currents. Pure zinc or amalgamated zinc—which is supposed to have an "electrochemically" homogeneous surface, will not go into solution, because no electrolytic action is possible. Iron, according to this conception, behaves in an exactly similar manner, and if the conditions are such that an appreciable current can pass between two electrically different (*i.e.*, different in their solution pressures) parts of the iron, the more electro-positive portions will dissolve away ; this dissolution is a necessary preliminary to rusting. The conditions just referred to require the presence of oxygen dissolved in the water, for in oxygen free pure water the current that passes is almost infinitesimal, and the amount of iron dissolved can hardly be detected. The reason for this is, that the local current set up in the iron causes a film of hydrogen to be deposited on the more electro-negative portions, introducing an enormous resistance into the circuit. When oxygen is present, the hydrogen film is *depolarised*, and the current, therefore, persists and the solution of iron continues. That this explanation of the necessity for the presence of oxygen is a true one is borne out by what happens when a piece of commercial iron is dipped into a solution of pure copper sulphate in a vacuum. Here it is copper and not hydrogen that is deposited on the more electro-negative portions of the iron, and so the action is able to proceed until all the iron goes into solution or all the copper is removed. Mr. Lambert regards it as well-established that all that is necessary for the rusting of commercial iron is the presence of pure water and pure oxygen, and the carbonic acid theory which states that this, or some other acid, must always be present, must be abandoned in favour of the electrolytic theory, in face of the experimental evidence now supporting this hypothesis. The following experiments of Mr. Lambert must carry conviction on this point. He has prepared chemically pure iron that can be exposed to the action of tap-water and air for an indefinite time without showing signs of rust, and the same specimens would not replace copper from copper sulphate or nitrite solutions. Some of these specimens were, after careful drying, then subjected to pressure in a polished agate mortar by an agate pestle, and they were again put into water and exposed to the air

They rusted in the course of a few hours, rust forming first at the edges which had not been pressed by the agate, while the pressed portions remained quite bright. This is exactly what would be expected if the electrolytic theory is true, for the strained and unstrained portions of the iron will be two different modifications electrically considered, having different solution pressures, and so local currents will be set up when the metal is placed in water or copper sulphate.

The actual formation of rust is a secondary chemical action on the iron that has gone by electrolysis into solution in the form of ferrous ions. These ferrous ions combine with the hydroxyl ions present in the water to form undissociated ferrous-hydroxide.

$$Fe + 2\,(OH)' = Fe\,(OH)_2.$$

Then the oxygen in solution plays a second part, and converts the ferrous hydroxide into some hydrated form of ferric oxide, which is rust—

$$4\,Fe\,(OH)_2 + O_2 + 2\,H_2O = 4\,Fe\,(OH)_3.$$

The behaviour of pure iron towards copper chloride or in dilute alkali chloride solutions is strangely anomalous, and at present altogether inexplicable. Specimens which remain unaltered in the sulphate or nitrate are immediately attacked by copper chloride and will corrode in quite dilute salt solutions, and this curious behaviour cannot be accounted for by the presence of a protective film of oxide or hydride on the iron. The matter is being further investigated by Mr. Lambert.

Very interesting is Mr. Lambert's suggestion—plausible, although as yet unsupported by experimental evidence—that substances which protect iron from corrosion have the power, in some way or other, of destroying or reducing the electrical differences which always exist in commercial forms of iron—that they have a passiviving effect—and that the substances, like the chlorides of the alkali metals, which stimulate corrosion, do so by increasing these electrical differences. This would explain the remarkable behaviour of pure iron towards copper chloride and alkali chloride solutions.

Mr. J. I. Crabtree, M.Sc., read a paper on "The Nature of Over-voltage." Apart from the intrinsic interest of this peculiar phenomenon to the electro-chemist, Mr. Crabtree shows how direct a bearing the subject has on the question of corrosion, as will be explained presently. The over-voltage of a metal may be regarded as the excess of the anodic or cathodic decomposition voltage of a dilute acid with an electrode of that metal over that for platinised platinum, or as the excess of the back E.M.F. set up at the electrode after polarisation over that set up by a platinised platinum plate under identical conditions. Mr. Crabtree's method of determining this back E.M.F. is by alternately polarising an electrode in deci-normal H_2SO_4 for 30 minutes, and then measuring its single potential difference (against a "normal" electrode) by means of a potentiometer. The over-voltage is not a constant for any given metal, but it varies with such factors as the time of application of the polarising current, current density, thickness and physical condition of the surface of the electrode, depending to an unknown degree on the presence of some foreign bodies, such as colloids and alkeloids, in the electrolyte, and, of course, above all on the nature of the metal. The values for the cathodic over-voltage of the commoner metals are in the following order of magnitude :—

$$Hg \longrightarrow Pb \longrightarrow Cd \longrightarrow Sn \longrightarrow Bi \longrightarrow Sb \longrightarrow Ni \longrightarrow Pt.$$

Over-voltage is, in all probability, closely connected with the transformation of the gas evolved at the electrode from the ionic to the molecular state, and it may be a measure of the difference between the rate of production of ions and of their combination to form neutral gaseous molecules or groups of molecules. Nernst supposes that this ionic combination can only take place within the electrode, which possibly acts as a sort of catalytic agent. This may explain why the over-voltage for metals like platinum and nickel, which easily occlude gases, is so low, although other factors would also come into play. Generally, therefore, it may be said that over-voltage is proportional to the power of the metal for affecting the velocity of the reaction—

$$\text{ions} \rightleftharpoons \text{molecules}.$$

Perhaps the ions, after being discharged, pass into a condition of unstable equilibrium, and give rise to a back E.M.F.

If the electrolytic theory of corrosion put forward by Mr. Lambert, as outlined above, be correct, the relation of over-voltage to corrosion will be obvious. The effect of over-voltage will be either to assist or retard the deposition of hydrogen or oxygen on the surface of the metal, thus directly affecting corrosion, or it will set up a back E.M.F., which will diminish the local currents that are the cause of corrosion ; or, finally, it may assist or prevent the solution of the metal. Thus, a metal will only go into solution in an acid if its over-voltage is less than the difference between the E.M.F. of the metal and the back E.M.F. of hydrogen. If the over-voltage is large, no solution of the metal can occur ; this is the case with amalgamated zinc, where the mercury is the cause of the high over-voltage. With galvanised iron, to take another example, very little solution of iron takes place, because the latter assumes the high over-voltage of its zinc covering.

Prof. W. W. Haldane Gee delivered a lecture, illustrated by experiments and lantern slides, on "Electrolytic Methods for Preventing the Corrosion of Metals." The principle underlying all these methods is to make the metal to be protected a cathode, either by attaching to it a more electro-positive metal, or else by means of an external current. The use of zinc in boilers is the best known example of the first method. Unfortunately its efficacy is somewhat impaired by a lack of exact experimental data with regard to the resistance of boiler waters and the effective voltages brought into play at temperatures of 150 200° C. The zinc consumption would appear to be much larger than it need be ; in some marine boilers it is as great as 400-600 lb. per annum. This is equivalent to a constantly flowing current of 17 to 25 amperes, and Prof. Gee points out that currents of such magnitude can be produced much more cheaply from dynamos, and devices are now in use in which an external source of current is employed. Mr. Elliott Cumberland, for example, places iron anodes in the water of the boiler, which is made cathode, using a small motor-generator to supply current, and the method has been found effective in removing scale as well as in preventing corrosion. Prof. Gee has found that the current densities necessary for the protection of iron and copper from the corrosive action of fresh or salt water are quite low, so that the cost of anodes would be the chief item of expense. Messrs. Harris and Anderson have applied electrical currents for the prevention of the corrosion of condensers. They find a condenser with a cooling surface of 1,025 sq. ft. requires only 2 volts and 2 amperes, and the special anodes used by them cost from £3 5s. per 1,000 sq. ft. per annum. The use of electrical currents may also be applied in chemical works to prevent the corrosion of metallic screens and vessels by acid liquids.

Phase Advancing.

(*Discussion on paper by* Dr. G. Kapp *before the* Institution of Electrical Engineers. *For abstract of paper see page* 784.)

Discussion at Birmingham.

Mr. R. A. Chattock said that the apparatus appeared to be so simple and reasonable in cost that it would probably be to the interest of the supply undertakings themselves to install it in connection with large motors on their supply. In Birmingham the transforming machinery in the sub-stations, consisting of rotary converters, was used for correcting the power factor, and in this way about two-thirds of the system was run at a power factor approaching unity. The system of metering described was a very interesting one, but it would be very difficult to explain this to a consumer, and to convince him that he was paying correctly for his units.

Mr. A. M. Taylor referred to Dr. Kapp's suggestion that if the central station would give a rebate to a consumer of 10 per cent. off the fixed charges, it would provide the consumer with the recompense which would warrant his incurring the extra capital expenditure to install phase-advancers. Dr. Kapp held that the Power Co. had no other expense to incur than that for fuel and water, and that as it gained new consumers without any further capital outlay, it was strongly to its interest to give the required discount. There was a fallacy in this reasoning, because in most cases the engineers of supply stations had already discounted for the power factor of their generators, and there was not the margin on the steam side, amounting to an extra 25 per cent., which Dr. Kapp's premises would involve. The conditions under which the station therefore obtained the new load were not very materially better than those under which it obtained its existing load, and in addition, the 4 per cent. loss on the consumer's motor had to be paid for from somewhere. Dr. Rosenberg, in his recent paper, stated that in order to improve the power factor from '707 to '8, the losses in a synchronous condenser able to give 250 K.V.A. would amount to 10 per cent. of the rating of the condenser. Dr. Kapp, however, appeared to allow that 4 per cent. would be sufficient.

Mr. N. Shuttleworth said that the question of power-factor improvement was being forced upon central station engineers, because of the rapidity with which existing cables were becoming overloaded, and the only remedy, in many cases, to save duplication was the adoption of a phase-advancing device. The author had given the costs per extra saleable KW., first, with synchronous motors running light, and, secondly, with loaded synchronous motors used also for the purpose of power-factor improvement. The relative costs were £7 to £10 per KW., and £2 per KW. respectively. The speaker was able to add to these figures the costs of phase-advancers for the same duties ; the variation was from 15s. to £2 per extra saleable KW., the cost depending upon the size of the motor to which the advancer was applied. The cost per K.V.A. reduction in the wattless component of the power supply varied from 8s. to 25s. per K.V.A. correction. There was a limit to which the phase advancer could be pushed, if unnecessary expense was to be avoided. To cause the main motor to draw leading current at 0·8 power factor, it was necessary to increase the rotor current more than 60 per cent., and to increase the size of the advancer in a still greater ratio. Generally speaking, the leading power factor on any one motor should not be lower than 0·9 for good results.

Mr. E. A. Watson said he was very much struck with the Scherbius phase advancer described in the paper as a machine which had no stationary part, with the exception of the brush gear. He did not quite agree with Prof. Kapp that the driving motor supplied the losses due to windage, friction and hysteresis. The windage and friction losses certainly were supplied mechanically, but he did not see how the hysteresis or eddy-current losses could be. No mechanical torque could be exerted on the revolving member without a corresponding equal and opposite torque being exerted on a fixed one. Any hysteresis loss, if supplied by the driving motor, implied the presence of a mechanical torque acting on the shaft, and this must be accompanied by an equal and opposite one acting on some fixed portion of the machine. As the only fixed portions were the brush gear and, to some extent, the surrounding air, it was not quite clear how this could exist. He was inclined to think that the true explanation was that these losses were supplied electrically through the windings of the advancer itself. One of the chief points of Prof. Kapp's arrange-

ment appeared to be that, although the vibrator only had to inject a small E.M.F. into the circuit, this was, as it were, magnified by the motor itself in approximately the ratio of 1/slip, and produced a vastly greater effect at the stator terminals.

Dr. M. L. Kahn said that the excitation of a synchronous motor required only a few per cent. of its output, and the excitation current was conveyed to such motors by short low-voltage leads. In the case of induction motors connected to a high-tension power transmission, the excitation had to be provided from the main station at the full voltage of the supply; with a power factor of ·8 the K.V.A. required for excitation were 75 per cent. of the kilowatts of energy transmitted, and the line losses were increased by 53 per cent. above the losses through the pure watt current. The arrangement invented by Prof. Kapp reduced the K.V.A. required by excitation approximately in the ratio of slip to full speed, as the excitation was not supplied to the stator with the full voltage, but to the rotor with a voltage of the order of the slip voltage. This exciting current was conveyed to the motor by short low-tension leads. One could see from this that by Prof. Kapp's arrangement the K.V.A. required for excitation, and the distance the exciting current had to travel, had been reduced to a small fraction of the values which were necessary in the case of ordinary induction motors. The induction motor was thus brought in line with the synchronous motor, as far as the excitation was concerned—the phase advancer taking the place of the exciter—without the disadvantages of low starting torque and synchronising difficulties. Moreover, the apparatus invented by Prof. Kapp required, if anything, less attention and was less likely to get out of order than the exciter of a synchronous machine. In considering the cost of the apparatus, one must take into account that the size of the induction motor could be materially reduced if a phase advancer was added, for the following reasons:—(1) The stator had only to carry the watt current, and the heating in this part was materially reduced; (2) the overload of a motor of a given size was increased by attaching a phase advancer; (3) the increase of rotor current due to the exciting current in the rotor did not affect the design materially, as the rotor of an induction motor usually worked well below the heating limits. Considering the case of a 1,300-B.H.P. induction motor wound for 8,000 volts, 50 periods, 272 R.P.M., with a power factor of ·82, which was made some years ago, it was found that by designing the machine for use in connection with a phase advancer, the diameter of the machine could be reduced 15 per cent., and the weight of the punchings could be reduced from 7½ to 5½ tons. This saving of material was effected without increasing the loading of the material, *i.e*, the loss per pound of material. The losses in the motor itself were slightly reduced, which made up for the losses in the phase advancer, so that the total energy consumed was not increased. For small motors, the conditions were not so favourable, but in the case of motors above 200 H.P. the phase advancer offered a very attractive proposition.

Mr. R. Orsettich said that it was very seldom realised that small motors running at slow speeds had generally a power factor below ·8, especially as they were mostly run below their full load rating. The result was that mines, collieries, and works plants found that after a time it was necessary to lay new cables in order to cope with the increased current expected from the power consumed. In plants of this kind the phase compensator explained by the author would be of great advantage. Large corporation plants were not affected to the same extent. A phase advancer either of the Scherbius or the Kapp type enabled an ordinary standard motor to be installed, with the only difference that no short-circuiting gear could be used, as the slip rings had to carry the current of the compensator. Both compensators had the disadvantage of requiring commutators, through which the rotor current must pass. The Scherbius compensator was usually driven by a separate small motor, and this corresponded approximately to the expenditure of a small separate exciter, which had to be fitted to the induction motor when using the Kapp compensator. It was quite possible to put up an induction motor of the standard type, fitted with a small exciter and an independent phase compensator of the Kapp system, against the cost of supplying a synchronous motor of the standard type, fitted with a starting motor and a small exciter. The price of a synchronous self-starting motor was much higher.

Dr. Sumpner stated that Mr. James Swinburne was the first to suggest using a magnetic vibrator as an A.C. load taking a leading current. Dr. Kapp's device was made possible commercially because he utilised the low frequencies of the rotor currents. It could be shown that the number of volt-amperes per phase taken by the Kapp vibrator was given by the formula—

$$\text{V A} = (\text{A}\, v)^2/\text{I}\, \omega.$$

where A was the rotor current in amperes passing into the vibrator armature; v the voltage generated in this armature if run at constant speed (one radian per second); I the moment of inertia of the armature; and $\omega = 2\pi\sigma f$, where f was the circuit frequency and σ was the slip. The numerator of the fraction was a constant for a particular armature, since the allowable current A was inversely proportional to the number of conductors determining the voltage v. Hence, to increase the volt-amperes it was necessary to keep the values of I and ω small. The importance of the smallness of the slip frequency σf was two-fold. It not only increased the capacity of the armature in volt-amperes, but also reduced the number of volt-amperes needed for compensation.

Mr. A. R. Everest said there was a large field for devices which would overcome the low power factor inherently associated with certain classes of load. It was somewhat surprising to find the self-starting synchronous motor regarded as a comparative novelty. In the United States they had been building self-starting machines for some years past. Dr. Kapp mentioned two British firms now building such machines, and the British Thomson-Houston Co., Ltd., also built self-starting synchronous motors, having even better starting characteristics (in torque per ampere) than the corresponding sizes of squirrel-cage induction motors. They were started under the same conditions of load as the squirrel-cage motors, and with the same device to reduce the applied voltage at starting. No synchronising was required, as the motor pulled into step when the field was excited. Such machines were well suited for use with a surplus of excitation, so as to draw leading current and neutralise a bad power factor arising elsewhere.

Discussion in London.

Mr. W. M. Mordey, who opened the discussion, regretted that the author had dismissed so briefly the use of electrostatic condensers as phase correctors. He had personally been attracted by the subject, and mentioned the paper he contributed to the Institution bearing on the matter in 1909. Now that condensers were so cheap it appeared that there was some chance of using them in this way. The Walker advancer cost about £2 per K.V.A., and he believed that proper condensers could now be obtained at a figure comparable with the apparent cost of the author's apparatus—say, 10s. per K.V.A. The apparatus described appeared greatly to increase the slip, and this might be a serious disadvantage in some cases. The efficiency (88 per cent.) of the Brown-Boveri motor appeared to be low, and might have affected the results. The figure attributed to Mr. Ashton—£1·9 per K.V.A. for static condensers—was much higher than he (the speaker) had found some years ago.

Mr. A. W. Ashton said it was three years since the first electrostatic condenser was used in this country on a practical scale—for improving the power factor of an arc lamp circuit in North London; within the last year three larger orders had been carried out by the B.I. and Helsby people for pressures of 550 volts, 50 periods, and for 7,000 volts, which showed that this type of condenser was not altogether out of the running. No breakdown had come to the notice of the makers; the condensers were, of course, largely confined to 50-period circuits. The condenser could be applied close to the apparatus having a poor power factor and was suitable for comparatively small motors. Looking over the cost of installing the phase-advancer, given in the paper, he thought the consumer would have to have 10 per cent. discount before he obtained any advantage, taking into account losses and repayment of capital.

Mr. W. H. Bosworth thought the author's conclusions were rather unfair to the rotary condenser; he had over-estimated its size. In practice a machine used as a phase advancer and motor came out about 45 per cent. larger in capacity than a machine used as a motor alone, though the excess did not mean excessive cost on account of the higher speeds. This compared with 19 per cent. given by the author. The description of the Lancashire Dynamo Co.'s self-starting machine was not quite accurate: the latest starter was operated by one hand-wheel and interlocked switches. The combination of a phase advancer and motor cost more than a self-starting motor alone in his experience, and the latter machine seemed more suitable for ordinary commercial use. He congratulated the author on having drawn attention to the commercial possibilities of the subject.

Mr. F. Creedy said the Miles-Walker machine could be used for artificially reducing slip to zero, or making it a negative slip. Small slip was important, and he believed a much smaller slip could be obtained by employing a wound stator. He asked why attention was always given to the series type of machine; a shunt machine could improve the power factor at no-load.

Mr. J. T. Irwin suggested that the vibrator could be made to have a larger mechanical movement by employing a spring control or air buffers for bringing the armature back to the mean position.

Prof. Kapp, in replying, said he was glad to hear that condensers were commercially used. He did not disparage their use, but they could not improve the load conditions of a motor by using them. He agreed that there must be additional loss with the phase advancer and motor, two machines, but the saving in copper loss would, he thought, pay for the power used in the advancer. The efficiency of the condenser had not been stated (Mr. Ashton here mentioned a loss of not more than ·3 per cent.). It was a barbarous thing that they should chase thousands of amperes through the mains without getting anything for it. The objection to increased slip was not so serious if suitable cases were considered. As to the saving of weight, a speaker at Birmingham said there was a difference of 2 tons in favour of a 350-H.P. motor and advancer as against a motor without it. The movement of the vibrator was too great to make use of Mr. Irwin's suggestion.

Standard Clauses for Street Lighting Specifications.

Replying to Mr. Edgcumbe's letter (p. 788), Mr. F. W. Goodenough notes that he is still strongly of opinion that the average illumination in a street is of importance, and says this means that we have only got to arrive at some practical means for relating our specification to that average for us to get nearer the goal of agreement upon a standard specification. But first it is necessary to dispel the idea that minimum horizontal illumination is the only factor necessary to specify in an illumination contract. Mr. Trotter laid great stress upon the fact that the classification of streets made by the surveyors, as the result of an inspection of their lighting by night, was in agreement, to a considerable extent, with a classification of the same streets according to minimum horizontal illumination measurements. As Mr. Edgcumbe endorses Mr. Trotter's remarks in his letter, Mr. Goodenough wishes to point out the radical unsoundness of the argument, and to ask the surveyors to give careful consideration to the matter. If the lighting of the streets which the

surveyors inspected had been planned and carried out by contractors working to the specification as drafted, then it might well have been urged (though it still would not have been true) that lighting of a certain grade of value would always be produced in a street if a certain minimum horizontal illumination were specified. But that was not the case, and that is where the radical fallacy of the argument lies.

The lighting of the streets surveyed was designed and carried out on the usual plan of deciding, by experience and by experiment, what number of lamps of a certain description, placed on columns of a certain height, would give the kind of illumination that was desired or could be afforded in those streets. Those lamps on those posts at certain distances apart produced the illumination of the streets which the surveyors classified as A, B, C or D, according to their impression of that illumination on inspecting the streets. But that impression was produced by the following factors in combination:—The apparent brightness of the lamps; the height of the lamps above the street; the distance of the lamps apart; the maximum illumination in the street; the gradation of maximum down to minimum illumination in the street.

All these factors, not the last one only, go to make up the good, bad or indifferent lighting of a street. If in two streets you have about the same number of lamps of similar power on columns of similar height, you will get about the same maximum, average and minimum horizontal illumination. By a different number of lamps of different power on columns of different height, you can get the same minimum horizontal illumination, but a different maximum and a different average illumination—a differently lighted street altogether, such as no surveyor would class with the others.

Is it not, then, obviously illogical to say that to ensure that a street shall be lighted up to a certain standard, it is only necessary to specify the minimum illumination which the contractor is to give, leaving it to him to give what maximum and average illumination he chooses?

We must get it clearly into our minds that minimum horizontal illumination is only one of the effects produced "under present conditions of lighting," which were not built up on a specification with minimum horizontal illumination as its basis. Once we have all got to the point of agreeing that a standard specification of street lighting must have regard to the general result produced, and not to one factor alone of the several which form the whole, there will not be any serious difficulty in arriving at a practical form of specification.

Mr. Goodenough would consider that a specification had sufficient regard to the maximum and average illumination of a street if it laid down within reasonable limits what relation should exist between the candle-power measurements of lamps (of given height at defined distances apart) at three specified angles below the horizontal—say, at 10°, 20° and 50°, taken in the line of maximum illumination—with a clause providing that measurements taken at similar angles in any other direction should not be less than a specified percentage of those taken in the direction of maximum illumination.

Such a specification would not entail a heavy amount of work upon the engineer having supervision of the contract; it would sufficiently guard against "freak" spots of lighting, and it would overcome many of the objections raised against the draft specification.

The Dayton Flood.—Our contemporary, the *Electrical Review and Western Electrician*, of Chicago, relates experiences of electrical men during the recent terrible floods. Mr. Frank M. Tait, president of the Dayton Power and Light Co., who is also president of the National Electric Light Association, was a prisoner on the second floor of his home for two days, and grave fears were at one time entertained for his safety. He reports: "Both power plants under 12 ft. of mud and water for 50 hours." Some of the company's employés were "prisoners in the plant while the water covered everything." They told of having kept alive on the fruit that floated in from a neighbouring market and the rain which they caught in their hats. Vice-President J. W. Lieb, jun., vice-president of the New York Edison Co., describing the Dayton plant as he found it on the day after the water receded from the streets of the city, said:—

"After trudging a mile and a half over the wreckage, we reached the power house at 8 o'clock. There wasn't a soul in sight, and everything was covered with mud. Mud, mud, mud and slime a foot thick was over the generators, the switchboards, the motors, the engines, and a line of dirt showed where the water had reached the operating room, 13 ft. above the floor level. High up on the main steamline extended a walkway, and there, the only living thing in sight, perched a dog. Onions! The place was filled with them. They were thicker in the mud than raisins in a raisin cake. Twelve feet above the floor, on a generator frame, there were two crates full of sprouting red onions, while the whole top of the switchboard was lined with them. The dog was chewing one when we arrived, and from that we named him 'Onion.' But the place was an awful sight—sickening and discouraging. The mud nearly reached our knees, and in some places water still stood a foot deep on the floor. After a good look at the boiler room, still filled with water, we got out to hunt our friends, so we could start the task of clearing the wreckage and muck and get things going. This was no small task, and it took nearly 30 hours before the work of drying out could be started."

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Adams Lift Controller.

Fig. 1 shows a new controller for lifts and hoists, which is being introduced by the Adams Manufacturing Co., Ltd., of Bedford.

The controller for a small electric lift or hoist is as important as the motor itself, as on it depends the correct operation of the whole gear, and failure of even one small part is liable to upset the whole apparatus, while it is run by persons usually quite ignorant of electrical matters.

The lift controller illustrated is arranged for rope operation, the pulley for the rope being mounted on the spindle projecting from the top of the apparatus. It consists essentially of a box containing the necessary starting resistance. On the front of the box is mounted one of the new "Z" type automatic starters, which consists of a number of contact fingers which are brought into operation by the solenoid, and so arranged that the motor-starting resistance is gradually short-circuited and the motor brought up to speed. An adjustable dashpot controls the rate at which this part of the apparatus works. On top of the box is mounted a drum-type reversing switch which, by the operation of the rope, makes the circuits for the motor to revolve in the required direction, and then energises the solenoid on the "Z" type starter. The makers claim that it is an ideal controller for small reversible motors.

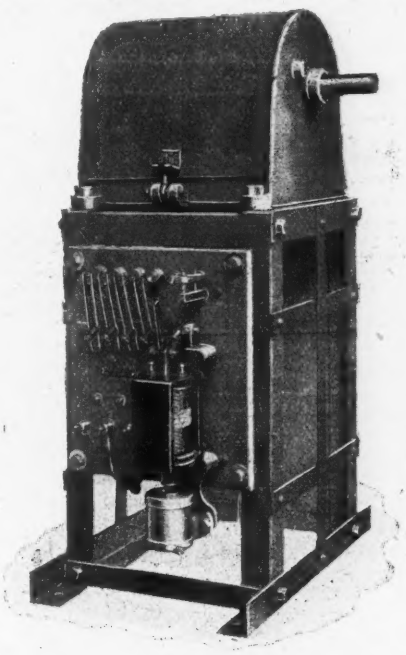


Fig. 1.—Adams Lift Controller.

A Dutch Oven Type Cooker.

We have received from Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, W.C., some particulars of their dutch-oven type "Plexsim" cookers.

Fig. 2.—Plexsim Dutch-Oven, Open.

These have been designed particularly for small householders, and will appeal to station engineers who favour hiring schemes on account of their low first cost and loading.

The small oven (14 in. × 14 in. × 15 in.) takes a maximum of 600 watts, and will cook up to 7-lb. joints; the larger one (21 in. × 21 in. × 22 in.) has a total loading of 1,200 watts, and takes joints up to 12 lb. weight. With the assistance of one or two extra hot-plates or self-contained utensils, it is claimed to carry out all the functions of the ordinary cast-iron stove.

Our views, figs. 2 and 3, show the arrangement of this cooker, for which it is claimed that heat losses from radiation and from the opening of the oven are to a great extent avoided owing to the construction adopted, and that this economises in energy consumption.

The explanation given is that the opening of the door or hood induces a partial vacuum behind the upright partition at the back of the shelves, and that in fact the heated air is retained in the hood.

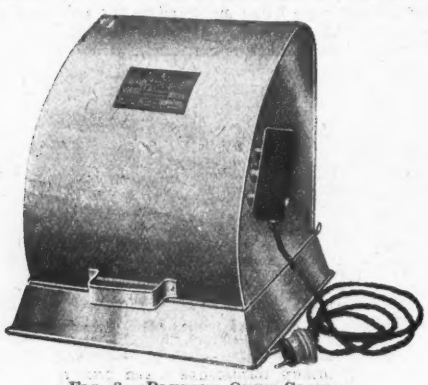


Fig. 3.—Plexsim Oven Closed.

We gather that the cooking temperature is reached within 5 minutes of switching on, and, moreover, that the apparatus has undergone exhaustive trials in the firm's own kitchen in practical use.

The oven is arranged for heat regulation, and is fitted with inside grids, two shelves and a drip tin. Temperature regulation is effected by a one-piece connector.

The elements are of the incandescent type, and actually roast; they are guaranteed for 12 months, and are readily renewable in a few minutes at home.

Inspection Lamp for Motor-Cars.

Messrs. Simplex Conduits, Ltd., of Garrison Lane, Birmingham, have recently introduced the inspection hand lamp, shown in fig. 4, in its cheapest form, for motor-car and similar work.

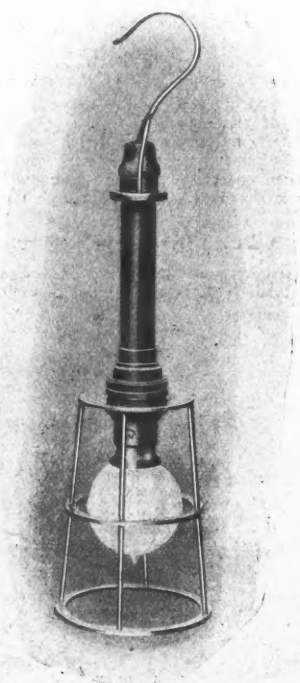


Fig. 4.—Inspection Hand Lamp.

The lamp shown is made in brass, with suspension hook and cord grip at the top, and has a substantial guard. Another pattern dispenses with the guard, the lamp being enclosed in an outer strong glass globe and provided with a solid handle and legs to stand the lamp upright; the latter pattern can also be supplied with a guard over the outer globe. The lamps are supplied for 4, 6, or 8 volts, and 3 yd. of flexible cord are provided.

Static Discharger Panel.

A compact and serviceable panel has been introduced by Messrs. A. Reyrolle & Co., of Hebburn-on-Tyne, for use separately or in conjunction with their enclosed sheet-steel switchgear, including multi-disk type spark gaps in series with isolating switches and

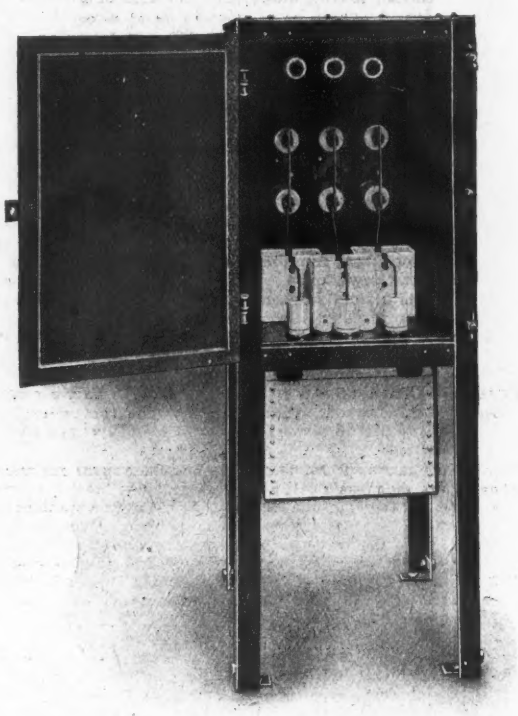


Fig. 5.—Reyrolle Static Discharger Panel.

Fig. 6.—Rear View of G.E.C. Standard High-pressure "Mistake-proof" Control Panel, with a Door Open.

current-limiting resistances. Fig. 5 shows the arrangement of the spark gaps and isolating switches. The resistances are of an oil-

immersed type, and the containing tank shown is arranged for lowering if required.

The panel illustrated is suitable for use on 3,000-volt three-phase systems. Other standard designs can be obtained for voltages up to 20,000, one form being made suitable for plugging into the solid type armoured switchgear.

G.E.C. "Mistake-proof" Switchboards.

A new line of "mistake-proof" panels has recently been designed by the General Electric Co., Ltd., of 67, Queen Victoria Street, London, E.C. In this design there are several noteworthy features. The isolating links and bus-bars are contained in a separate compartment situated at the top of the cubicles, and are partitioned off from the main cubicle by solid metal barriers, thus making it impossible for anybody accidentally to come into contact with live metal; cleaning and adjusting can therefore be carried out in absolute safety. The isolating links are firmly locked in position during the time the panel is in commission; they are operated from the front of the board, this doing away with the necessity of opening the doors to isolate the cubicle. The interlocking of the various pieces of apparatus is arranged in such a way that it is impossible to open or close the circuit with the links; this can only be done with the oil switch, a point of great importance. Neither marble nor slate enters into the construction of the board, the bus-bars, terminals and isolating links being supported on porcelain insulators. The framework and panels are of boiler plate, rendering the whole fireproof. No special foundations are required, and this, together with the fact that the whole of the gear is concentrated in the panel, reduces the erection cost to a minimum. A view of the panel is given in fig. 6, showing the arrangement of the interior.

LEGAL.

Gardiner *v.* London United Tramways, Ltd.

On May 7th before Mr. Justice Bucknill and a special jury in the King's Bench Division, an action was concluded in which Mr. C. E. S. Gardiner, consulting engineer and expert in oils, residing at St. Margaret's-on-Thames, sued the defendant company to recover damages for personal injuries sustained through the alleged negligence of the defendants' servants, while he was riding on the top of one of their electric cars in High Street, Brentford, on April 22nd, 1912, in the direction of Hampton Court.

The plaintiff's case was that he had his hand on the handrail, and as another car passed, his hand was struck by something, the flesh torn, and the wrist very seriously injured. The plaintiff also said that the line in the roadway was defective, and that the cars were oscillating considerably. The defendants denied negligence, and said plaintiff was guilty of contributory negligence by having his hand extended over the rail in disregard of a public warning to passengers as to the risk of doing so. Plaintiff denied that he had his hand extended beyond the rail.

The jury awarded the plaintiff £500 damages; judgment was entered accordingly against the defendant company, with costs, and a stay of execution was refused.

Poulsen Patent.

In the Chancery Division, on May 8th, before Mr. Justice Warrington, Mr. Austen Cartmell again mentioned the petition for the extension of the period of a Poulsen patent. He said the Solicitor-General was not able to name any day for the hearing of the petition, and he asked his Lordship to allow it to be mentioned at the beginning of next sittings.

His Lordship assented.

Austin *v.* L.C.C.

Mr. Chas. Austin, comedian, in an action tried by Mr. Justice Lush in the King's Bench Division, was on May 8th awarded £120 damages against the London County Council in respect to damage to a motor car which was sandwiched between two electric tramcars in Camberwell New Road one foggy night last October.

British Vacuum Cleaner Co., Ltd., *v.* James Robertshaw and Son, Ltd.

Mr. Justice Sargent, in the Chancery Division on Friday, May 9th, delivered his reserved judgment in this action, by which the plaintiffs sought to restrain an alleged infringement of their patent, granted to Hugh Cecil Booth in 1901.

The plaintiffs' case was that the defendants were advertising a domestic vacuum cleaner that was capable of being worked by electric or other motor power, which apparatus was an infringement of their patent. The defendants pleaded anticipation and non-infringement.

His Lordship said that with regard to anticipation, two patents by Harvey, one of 1893 and one of 1894, were relied on, but, in his opinion, neither of these covered the patent sued upon. They were for the removal of dust and not for its extraction. With regard to non-infringement, Messrs. Robertshaw said they made no high-power machines, and any machine that did not give a 5-lb. pressure per sq. in. did not come within the ambit of the plaintiffs' patent. He could not hold that the plaintiffs' patent was so limited. Moreover, he was not satisfied that the defendants' "Ideal" machine when attached to the domestic electric supply which would enable it to be moved nearer the work to be done would not give a 5-lb. pressure. He must hold, therefore, that the plaintiffs succeeded, and there must be an injunction as asked, with an inquiry as to damages.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

New American Tariff.

The Board of Trade have now issued a complete copy of the new tariff Bill, recently introduced by the United States Government, together with a copy of the existing tariff which it is proposed to revise, showing a comparison of the present and proposed duties. The following are extracts of particular interest to readers of the Electrical Review; the complete tariff may be obtained from Messrs. Wyman & Sons, Fetter Lane, E.C., and the cost is 1s.:—

	Present duties.	*Proposed duties.*
Mica and manufactures of mica, or of which mica is the component material of chief value ...		30 % ad val.
Mica, ground		15 % ad val.
The existing classification is—		
Mica, unmanufactured or rough, trimmed only.	5 cents. per lb. & 20 % ad val.	
Mica, cut or trimmed, mica plates or built up mica, and all manufactures of mica or of which mica is the component part of chief value	10 cents. per lb. and 20 % ad val.	
Carbon unmanufactured, not specially provided for	20 % ad val.	15 % ad val.
Porous carbon pots for electric batteries	20 % ad val.	15 % ad val.
Wire of iron or steel or other metal, except gold or silver, covered with cotton, silk or other material, and all flat wires and steel in strips, not thicker than No. 15 wire gauge, and not exceeding 5 in. in width, whether in long or short lengths, in coils or otherwise, and whether rolled or drawn through dies or rolls, or otherwise produced; telegraph, telephone and other wires and cables composed of metal and rubber, or of metal, rubber and other materials; iron and steel wire coated by dipping, galvanising or similar process with zinc, tin or other metal	Partly 40 % ad val. and partly 35 % ad val.	20 % ad val.
Electrodes for electric furnaces, electrolytic and battery purposes, brushes, plates and discs; all the foregoing, composed wholly or in chief value of carbon ...	30 % ad val.	25 % ad val.
Carbons for electric lighting, wholly or partly finished:		
Made entirely from petroleum coke	35 cents per 100 ft.	15 cents per 100 ft.
If composed chiefly of lampblack or retort carbon	65 cents per 100 ft.	40 cents per 100 ft.
Steam engines, locomotives and machine tools	30 % ad val.	15 % ad val.
Articles or wares not specially provided for in the tariff under the section of "Metal and manufactures thereof" (N.B.—This heading applies to a very large number of machines and metal manufactures):		
If composed wholly or in chief value of iron, steel, lead, copper, nickel, pewter, zinc, aluminium or other metal, and whether partly or wholly manufactured	45 % ad val.	25 % ad val.
Manufactures of india-rubber or gutta-percha	35 % ad val.	10 % ad val.

Of the proposed new regulations under the tariff, the following is one of the most important:—"That a discount of 5 per cent. on all duties imposed by this Act shall be allowed on such goods, wares and merchandise as shall be imported in vessels built in the United States, and which shall be the property of a citizen or citizens thereof."

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

9,893. "Electrically-operated drill of the percussion type." T. F. Wall. April 28th.

9,904. "Loud sound reproducing telephones." W. E. Jennings. April 28th.

9,930. "Electric water-heaters and the like." R. Weaving and Ferranti, Ltd. April 28th.

9,946. "Portable electric battery lamps." B. Pordes. April 28th.

9,959. "Variable resistances for automatic regulation of electric currents." A. G. Bloxam. (R. Bosch (firm of), Germany.) April 28th. (Complete.)

9,986. "Selective system of telephony." R. C. M. Hastings. April 28th. (Complete.)

9,987. "Sparking-plugs for internal-combustion engines." S. White. April 28th.

9,996. "Control of electro-mechanical transmission gears." H. F. Haworth. April 29th.

9,998. "Electrically insulated railway joints." W. W. Lewis and T. A. R. Terrell. April 29th.

10,004. "Electric incandescent lampholders." H. T. Wilkinson. April 29th.

10,006. "Means for filtering electroplating and the like solutions." A. H. Railing and A. J. D. Krause. April 29th.

10,018. "Substitution resistances for electric lamps." W. Heins. (Addition to 9,530, 1913. Convention date, November 25th, 1912, Germany.) April 29th. (Complete.)

10,020. "System of electrical traction." F. Stone and F. J. Chapple. April 29th.

10,031. "Deriving electric current formed by means of thermo-electric elements." P. Ferra. April 29th.

10,036. "Apparatus for the direct conversion of heat into electricity." J. Gyuris. April 29th. (Complete.)

10,046. "Electrical fire-alarms." T. W. Gosden. April 29th.

10,073. "Electrically-operated drills." H. W. Darby and F. J. West. April 29th. (Complete.)

10,074. "Means for electrically transmitting and indicating orders, signals, information, or the like." C. J. Evans. April 29th. (Addition to 26,694/12.)

10,075. "Incandescence lamps." J. R. Quain. April 29th.

10,077. "Electric switch having make and break contact immersed in a liquid." Allgemeine Elektricitats Ges. (Convention date, May 1st, 1912, Germany.) April 29th. (Complete.)

10,081. "Circuit controllers." H. W. Darby and F. J. West. April 29th. (Complete.)

10,098. "Lighting operating or like tables." H. Wade. (Dr. Ing. Schneider and Naujoks Elektrizitäts Ges., Germany.) April 29th.

10,100. "Electric clocks." T. Rushton. April 29th. (Complete.)

10,105. "Electric hair singe." J. H. Watkins. April 30th.

10,107. "Incandescent lighting and appliances therefor." J. Booth. April 30th.

10,153. "Wireless telephone." F. Majorana. April 30th. (Complete.)

10,154. "Telephone relay." F. Majorana. April 30th. (Complete.)

10,157. "Form of electric annunciation and circuit changer." E. E. Moore. April 30th.

10,160. "Caller for wireless telegraphy." M. Corlon. April 30th.

10,164. "Flexible electric conductors." Western Electric Co., Ltd. (Western Electric Co., United States.) April 30th. (Complete.)

10,181. "Method of regulating the current in direct current arc lighting, search lights, electric welding, and the like." A. Martin, H. Jackson, A. J. Campbell, T. B. Campbell and W. Campbell. April 30th. (Complete.)

10,188. "Means for raising and supporting arc and other lamps and the like." G. A. Hughes (trading as London Electric Firm). April 30th.

10,190. "Electrically or mechanically-vibrated diaphragms for sound devices." G. St. B. S. Watkins. April 30th.

10,195. "Telegraphy." P. O'Neil. April 30th.

10,200. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co., United States.) April 30th. (Complete.)

10,203. "Voltage control of electric circuits." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 30th.

10,205. "Electric couplings." J. A. Ross. April 30th.

10,210. "Manufacture of electric carbons." J. Roubal. April 30th. (Complete.)

10,225. "Method of cleaning and coating inside and outside of tubes with metals or alloys by electro-deposition with the aid of mechanical devices." C. Hatthorpe. May 1st.

10,232. "Apparatus for detecting weak electric currents." G. E. Turnbull. May 1st.

10,252. "Substitution resistances for electric lamps." W. Heins. (Addition to 9,530 of 1913. Convention date, March 11th, 1913, Germany.) May 1st. (Complete.)

10,273. "Telephone with poles arranged concentrically." Siemens Bros. and Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) May 1st. (Complete.)

10,289. "Electric radiators for heating." C. Arpin. (Convention date May 2nd, 1912, France.) May 1st. (Complete.)

10,304. "Electric arc lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) May 1st.

10,369. "Process for fusing difficultly-fusible metals." Siemens Bros. and Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) May 2nd. (Complete.)

10,373. "Arrangement for electrically operating jacquard machines." G. Corsi. May 2nd. (Complete.)

10,396. "Electrical interrupters or vibrators." F. Knabl. May 2nd.

10,399. "Telephone transmitters." A. Plecher. May 2nd. (Complete.)

10,403. "Apparatus for heating water and other liquids by electricity, particularly applicable as a bath heater." C. Arpin. (Convention date, May 3rd, 1912, France.) May 2nd. (Complete.)

10,416. "Electric motor-control apparatus." A. H. Railing and C. C. Garrard. May 3rd.

10,422. "Counterweights for pendant electric light fittings." J. M. Doughty. May 3rd. (Complete.)

10,423. "Manufacture of electric incandescence light-emitting bodies by electrical means." E. M. Bailey, W. Taylor and T. Middleton. May 3rd.

10,431. "Arrangements of apparatus and circuits for counting and registering telephone calls." T. F. Purves. May 3rd.

10,454. "Lampholders for electric light." F. A. Basnett and J. N. Mollett. May 3rd.

10,460. "Machines for reproducing patterns, pictures, or the like with the aid of electric currents." A. G. Bloxam. (Siemens-Schuckertwerke G.m.b.H., Germany.) May 3rd. (Complete.)

10,468. "Means for increasing the efficiency of electric incandescent lamps." O. L. Peard. May 3rd.

10,470. "Electric switches." J. Stone & Co., Ltd., and A. H. Darker. May 3rd.

10,472. "Electrical relay arrangements." A. N. Hovland. (Convention date, May 6th, 1912, Norway.) May 3rd. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

Electric Storage Systems. C. F. Kettering. 3,794. February 15th. (May 22nd, 1911.)

Transformation of Direct Currents. Akt.-Ges. Brown, Boveri & Cie. 6,550. March 16th. (March 17th, 1911.)

Combined Intercommunication and Party Line Telephone Systems and the Like. Sterling Telephone and Electric Co. (Telephon Fabrik Akt.-Ges. vorm J. Berliner.) 6,580. March 16th.

Electric Arc Furnaces. E. C. R. Marks. (Patent Purchasing Co.) 8,791. April 13th.

Telephony. S. G. Brown. 9,179. April 18th.

Electric Cables. Western Electric Co. (Western Electric Co.) 9,309. April 19th.

Synchronous Dynamo-electric Machines. E. Rosenberg. 9,644. April 23rd.

Direction "Tell-tale" or Indicating Apparatus. J. C. Clarke and Chadburns (Ship) Telegraph Co. 9,673. April 24th.

Automatic Wireless Alarm. S. D. Williams. 9,882. April 26th.

Phase Compensation of Dynamo-electric Induction Machinery. Akt.-Ges. Brown, Boveri & Cie. 10,113. April 29th. (April 29th, 1911.)

Electric Flame Arc Lamps. F. W. E. Schuer. 10,496. May 3rd.

Supporting of Insulators for Electric Conductors. E. C. R. Marks. (Reinert.) 10,805. May 7th.

Carrying of Metal-sheathed Electric Cables through Bulkhead and Similar Partitions. Metal Jointing Co., Ltd., and T. Harden. 10,989. May 8th.

Manufacture of Metallic Filaments for Incandescent Electric Lamps. J. A. Scoular and Dick, Kerr & Co. 11,455. May 14th.

Lugs of Accumulators. J. C. Wood. 12,718. May 30th.

Electric Switches for Multiple-unit Control Systems. P. S. Turner. 13,740. June 12th.

Receivers for Printing-telegraph Systems. G. S. Hiltz. 14,831. June 25th.

Electric Brakes for Tramway and like Vehicles. P. S. Turner. 15,023. June 27th.

Telegraphic Apparatus. H. Knudsen. 15,591. July 3rd.

Electric Switches. British Thomson-Houston Co. and J. M. Wallace. 15,776. July 5th.

Keyboard-Controlled Electric Illuminated Signs for Advertising and the Like. J. W. Cook. 16,765. July 18th.

Method for the Production of Filament Holders for Metal-filament Electric Incandescent Lamps. M. Baum. 16,865. July 19th.

Magnetic Speedometers. J. K. Stewart. 17,492. August 2nd.

Electrometers and Appliances for Indicating and Measuring Variations in Electric Potential, especially in Earth Potential, and a Method of Applying the Same for Meteorological Purposes. A. H. Maurice. 18,065. August 6th.

Motor-actuated Extensible Ladders for Fire Escapes and the Like. "Cedes" Electric Traction, Ltd., and E. Clifford. 20,244. September 5th.

Electromagnetically-operated Switches particularly Adapted for Controlling Electric Motors. E. Schattner. 20,247. September 5th.

Electrical Protective Apparatus. S. de Stefani. 22,129. September 28th.

Oscillating Spring Contact for Operating Electric Bells and such like Apparatus. F. Burr, jun. 22,311. October 1st.

Time Lag Devices for Electric Switches and other Apparatus. M. J. Railing, J. Strachan and H. J. Coates. 22,509. October 3rd.

Electrical Egg Tester. H. B. Garnham and A. E. Garnham. 22,603. October 4th.

Electric Discharge Apparatus. Q. Majorana. 23,024. October 9th.

Parallel Working of Synchronous Machines. E. C. R. Marks. (Akt.-Ges. Brown, Boveri & Cie.) 24,097. October 22nd.

Means for Setting the Timing Gear of Electrical Ignition Systems. J. E. Sturgeon. 26,443. November 18th.

Circuit Arrangements for the Reception of Signals Transmitted by Means of Electromagnetic Waves. O. Imray. (Compagnie Generale Radiotelegraphique.) 28,070. December 5th.

Electric Current Transformers. E. C. Wescott. 28,967. December 16th.

1913.

Hot-wire Electrical Measuring Instruments. Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges.) 948. January 13th.

Electric Vulcanisers for Tires. B. Kisshazy. 1,579. January 20th.

Antiseptic Guards for Telephone Mouthpieces. C. V. Fuller. 4,704. February 24th. (February 28th, 1912.)

Telephone Systems. Sterling Telephone and Electric Co., Ltd. (Telephon Fabrik Akt.-Ges. vorm J. Berliner.) 7,593. March 31st. (Divided application on No. 6,580 of 1912, March 16th.)

Tramway Accidents.—In the Parliamentary Papers, Mr. Watt asked the Secretary for Scotland whether, before instituting any Commission to consider means of reducing the number of accidents in the large cities of Scotland, he proposed to wait for requests for such Commission from the Town Councils of such cities; whether he was aware that the tramcars of such Corporations were permitted to run up to 16 miles per hour, as *e.g.* in Glasgow; that this regulation precluded the Corporations from insisting on the 10-mile limit of motor-cars; and that these facts caused unnecessary risk to the public; and whether he would introduce legislation limiting the speeds of vehicles in towns in Scotland? Mr. McKinnon Wood replied that he was not satisfied as to the need of special inquiries into the matters to which he referred, though he was, of course, prepared to consider requests from Town Councils or other quarters. He must not, however, be taken as assenting to the implications conveyed in the question.